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Lighting Developments

THE vast potentialities of our industry are shown nowhere better than in the developments that are still taking place in what is—apart from communications—its oldest application for public supply. Although the characteristics of the lighting load make it more expensive per unit than other electrical services, it is worth even more than its additional cost to the general public, as probably nothing has revolutionised our lives to the same extent as modern methods of illumination. This shows the weakness of the "unit" as a method of charging.

In industry, as Mr. W. J. Jones pointed out in our "Power" special number, a small additional amount spent on the adequate lighting of workshops can repay its cost many times in improved production. It is the easily demonstrable truth of this that makes so disappointing the statement in the last Factory Report that few workshops have really satisfactory lighting installations.

There is plenty of evidence that, even in its most obvious appeal to the economic sense, electricity will not sell itself and that there is very considerable scope for putting into practice the most readily accepted principles of the present day.

It is not a question of competition with other methods of illumination, as for interior uses there is none, but of improvement in the standard of installation layouts and candle-power intensities. Experience has shown that a better standard results in higher load factors, and this tendency is accelerated where a two-part tariff is in force.

Only in street lighting is there a competitor, but that is also a state of things that will pass. The lower cost of control by photo-electric cells or carrier currents, which will, we believe, be widely adopted in the near future and the facilities electricity offers for remote switching, all help to place it on a more favourable basis than any other form of illuminant.

Looking farther ahead still, Sir Hugo Hirst visualises our main arterial roads lighted by lamps of the hot-cathode type with an efficiency about three times that of the best commercial lamp now available. Already experimental 400-W lamps, with a light source formed of 6-in. vertical vapour columns made luminous by the passage of current, have been run off 230-V mains for lighting a public street, without the somewhat unusual colour-rendering of objects being too noticeable. But there would appear to be many difficulties to overcome before the installation of this type of lamp becomes practicable on any large scale.

Mr. Sully told us at the I.M.E.A. Convention that these lamps would not be placed on the market until the makers were in every way satisfied that they would fulfil expectations and that their cost would be reasonable. We gathered that he did not anticipate that this would be just yet. 'Tis a consummation devoutly to be wished, but it would be a mistake to allow the wish to be father to the thought that the street-lighting load will so soon be ours for the asking that we need not go on hammering away at the problem of how to capture it bit by bit.

If we ignore for practical purposes the bright hopes for the future and try to beat our competitor with what is at present practicable, we shall be in all the better position when more efficient lamps become available to take Alderman Walker's hint to charge by the unit of light and not by the unit of electricity.

Britain's Electrical Future

WE publish in our "Correspondence" pages to-day a letter received from Mr. F. W. Purse, chief engineer to the London and Home Counties Joint Electricity Authority, on the article on the electricity supply outlook contributed to our last issue by "Forty Years." The writer, whose views have attracted attention, weighed up some of the outstanding circumstances and considerations, and in groping about for a solution, or the lines leading toward it, he expressed what some may regard as unconventional and even daring ideas. That, surely, is all to the good if it induces those who know the subject to express their opinions. It would be help-

ful to the industry if there were more free discussion of our problems in the Press instead of a disposition to save up what one thinks for the formal meeting, for the summer convention, or for some set after-luncheon or after-dinner speech when a comparatively small number are gathered together. We are indebted to Mr. Purse for so promptly contributing his view, which is that there should be a wider application of the principle of joint electricity authorities, and we invite all interests to take part in what might well prove a particularly profitable discussion at the present time.

Contractors' Dissatisfaction

THE dominating impression of what was heard at the E.C.A. Conference at Southport last week, both in and out of the conference room, was that the contractors are dissatisfied with their relationship with the supply undertakings. Full co-operation, it was asserted, has been effected with the manufacturers, but so far the suppliers have held back from the suggested trinity. The position is a little difficult to understand, because all the many supply undertakings we have visited during the last few years have told us that "relations with the local contractors are very cordial." Municipal trading, or, rather, supply-undertaking trading, is, of course, a sore point with the contractors. Another grievance is the difficulty which contractors in many cases have to obtain supplies for new consumers, owing to unjustifiable restrictions enforced by the supply authorities. It should not be necessary at this time of day to repeat that electricity supply should be simply and easily obtainable, and that where difficulties arise, commercial or technical, these should be openly explained to all concerned. We emphatically agree with the plea for co-operation, for disunion is a brake on progress, and progress, with the grid nearing completion, is absolutely essential.

Charges for Water Heating

IN an article published in this issue Mr. D. J. Bolton shows that domestic water heating by electricity competes quite well with other methods at charges up to ¾d. per kWh, provided the layout is designed from the electrical aspect. In practice, we believe lower rates will be found necessary to allow for the difficulty found by many in adapting their outlook so as to make the most of the all-electric way. Under a grid tariff, with a low running charge, the costs of supplying electricity for any specific purpose, whether on or off peak, will be on a much more definite basis; this will relieve the mind of the progressive supply engineer of any fear that he is taking a risk in supplying electricity at only a little above running cost. But the doctrine that low charges are not more important than good service is of especial importance in the domestic water heating field and calls for the employment of specialists in the subject.

Supply in the London Area

THE units sold in the London and Home Counties Electricity District are about one-fifth of those sold in the whole of Great Britain, and their relative values from year to year exercise a considerable influence on the total figure. The Authority's report for the period 1930-1931, issued on Tuesday (Eyre & Spottiswood, Ltd., 5s. net), shows that sales (excluding bulk supplies to authorised undertakings) had increased by 10.6 per cent. to 2,793 million, which compares with 5 per cent. for the whole country. The rate of increase suffered a big drop from the 27 per cent. of the previous year, bigger than that for Great Britain as a whole, for which the preceding year's increase was 11.5 per cent. Units per head were 341 in London and 202 for the whole country. No particulars are available of the electricity produced in private plants, except traction stations, which generated an amount equal to about one-third of that generated by authorised undertakings in the district. We hope that when Battersea and Fulham get going an apparently startling increase in the output from authorised undertakings will result from the acquisition of a good part of the loads now supplied from independent sources.

Ten Thousand Cookers

THE popularity of electrical hiring schemes, as well as the satisfaction given by electric cooking, is amply demonstrated by the rapid progress made in this direction by the Manchester Corporation Electricity Department. As we report in this issue, the Department let out its ten-thousandth cooker last week and celebrated the event by presenting the consumer concerned with a set of aluminium cooking utensils. No doubt, size for size, there are undertakings which have equalled or even surpassed this performance. Be that as it may, what Manchester thinks about electric cooking to-day the whole country will be thinking to-morrow.

International Electricity

ALTHOUGH the International Electrotechnical Commission has been in existence for only just over twenty-five years, the co-operation between electrical engineers of different countries to which it gives formal shape found its first expression in 1881, when the first International Electricity Congress took place in Paris to settle standards for electrical units so that engineers throughout the world might in one basic essential speak a common language. The decisions taken at the original Congress had a great influence on subsequent electro-technical developments. At the "jubilee" Congress opened this week in Paris the fundamental relations between electricity and physics are emphasised by the active part taken by many noted physicists. An international meeting would not be complete without the presence of Col. Crompton, but probably few of our readers will recall that he was an active member of the first Congress. This illustrates the youth of our industry, also.

Local Expenditure

THE Chancellor of the Exchequer has issued an appeal to the local authorities of England and Wales and Scotland, through their representative associations, asking them to combine in the appointment of a committee to consider the whole field of local expenditure. They are to make recommendations for securing further reductions in such expenditure whether defrayed from Exchequer grants, rates, or other sources, and whether or not imposed on local authorities as a duty by statute, order, rule, or regulation. The Government regards the matter as one of grave importance and urgency, and wants the main committee to begin work by the middle of the current month so that definite views and recommendations may be ready by the end of October for the guidance of Parliament. As has been stated with emphasis again and again, it can only be detrimental to the national interests if wise spending upon the requisite development of electrical undertakings which serve the industrial and public needs is to be held up. Under existing conditions it may seem regrettable that so many undertakings are municipally owned, but the outlay is revenue-earning and largely profitable—not a burden on the ratepayer. The outstanding municipal electricity loans stood at £106 millions two years ago. The Minister of Transport may possibly regard it as good policy to let his voice be heard on this matter.

The Electrified "Southern"

THE Southern Railway has found in electrification a means of coping with its very dense traffic, and the new system is a very sound way of meeting road competition. Perhaps the most significant feature of the Railway's latest extension, which we deal with in this issue, is that it is main-line electrification—a precursor, we hope, to further considerable developments in this direction.

THE CONTRACTORS' CONFERENCE

GENERAL enthusiasm, good organisation, and fine weather combined to make a complete success of the seventh annual conference of the Electrical Contractors' Association and its allied bodies at Southport last week, and the attendance was excellent in spite of trade depression.

The social functions again demonstrated how the contractors look forward to these infrequent opportunities of "getting together"; an excellent spirit of fellowship prevailed at the president's reception on the first evening, the smoking concert on Wednesday evening, the tea dance on Thursday afternoon, the substitution of which for the scheduled garden party was obviously generally approved, and the ball and supper at the Prince of Wales Hotel on the last evening, at the invitation of the Mayor of Southport, Councillor W. H. Bellis, LL.B.

A good attendance of ladies added colour to the convention—not only at the social events—and many members enjoyed the facilities provided by the Corporation for recreation—bowling, tennis, golf, bathing, &c.

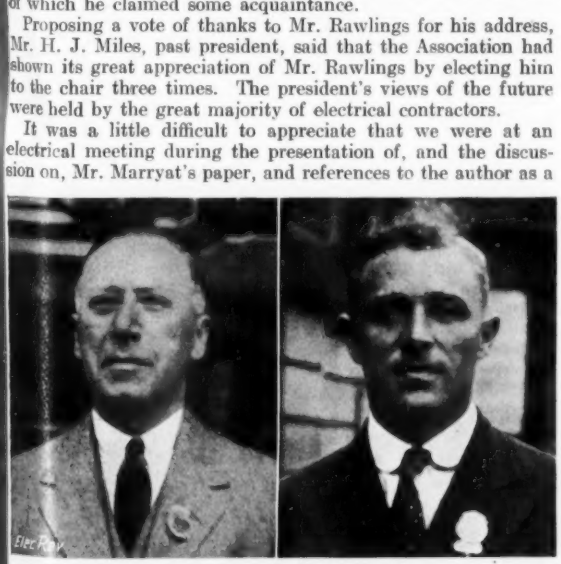
The members turned up early on Wednesday morning for the annual general meeting, at which Mr. W. R. Rawlings, the president, presented his report, which was reviewed in our last issue. It gratified members to hear that the total membership at April 30th last was 1,308, as compared with 1,195 at May 1st, 1931. Judging from comments heard after the meeting the official announcement of the appointment of Mr. L. C. Penwill as director as well as secretary was wholeheartedly approved.

"Too Gloomy"

The subsequent delivery of his presidential address by Mr. Rawlings was interrupted by the arrival of the Mayor, whose hearty welcome to the delegates was spiced a little by his unusual criticism of the opening remarks of Mr. H. Marryat's paper, "Looking Forward: the Trend of Trade" (*vide* our last issue) which, apparently, he had glanced at while waiting for his introduction. He thought that the words "Trade is bad, and there is a feeling abroad that it is going to be worse," depicted much too gloomy a view for the electrical industry, of which he claimed some acquaintance.

Proposing a vote of thanks to Mr. Rawlings for his address, Mr. H. J. Miles, past president, said that the Association had shown its great appreciation of Mr. Rawlings by electing him to the chair three times. The president's views of the future were held by the great majority of electrical contractors.

It was a little difficult to appreciate that we were at an electrical meeting during the presentation of, and the discussion on, Mr. Marryat's paper, and references to the author as a politician, statesman, &c., led us to believe that this was the general feeling of the meeting. Our anticipation, however, that the subject might prove too broad for spirited discussion was not substantiated. The discussion was good, although it was more complimentary than critical.



Mr. H. Willoughby Ellis, past-president, and Mr. L. C. Penwill, director and secretary

The Paper Commended

The president, calling for discussion, said the paper was worthy of a prime minister. Mr. W. Finlay (Edinburgh) saw the author as the philosopher, the analytical electrical mind, the seer and the statesman. There were no signs of a real forward movement yet. There would be little hope for

Mr. Rawlings shows his presentation watch to Messrs. W. B. Williams and P. Hewitt

contractors while irons which should be marketed at 12s. 6d. each were sold at 7s. 6d. Too much manufacturers' money was bound up in gilt-edged securities; a spirit of adventure was wanted, and the electrical industry should convince the public that electricity was an absolute necessity.

An intellectual treat was Mr. W. J. Jones's (E.L.M.A.) comment on the paper. Referring to the recently instituted hotel lighting campaign of E.D.A., he said the aim was to ensure that the electrical trade should be brought into contact with the 10,000 hotels in this country and thereby make them more attractive. It was essential that the resulting installation work should be carried out by the contractors who would ordinarily do the work, and to ensure success steps should be taken to see that sufficient E.D.A. Circles were established. The movement represented a magnificent advertising opportunity.

Alderman R. Tweedy-Smith, solicitor to the E.C.A., saw the nation slowly bleeding to death as the result of heavy taxation. Only something drastic would cure it. Rationalisation should involve using money which had been saved and was unproductive.

Rural Opportunities

Mr. H. W. Roberts (G.E.C.), representing the manufacturers, felt that the mistake was still being made of treating industrial and domestic supplies as a dual problem. Turnover in money in the electrical industry was very small compared with that in the larger industries. The agricultural industry showed £300 million per annum. If it could be induced to spend one million of that on electrification the electrical industry would be very busy. Farming represented the greatest field for the immediate future. The real troubles of the electrical industry were within the industry, which should be better organised. He advocated a "play the game" cam-

paign—at present all sections were pulling against one another. Some adverse publicity was being obtained from the grid, leading to the entry of inexperienced people into the electrical field and causing much trouble. It should be recognised that the cost of distribution of goods was closely allied with the cost of distribution of electrical energy.

The paper had given the industry a new outlook, said Mr. F. W. Cook (Southampton). It was idealistic and a paper

At the first business session

of the young man. The fact that so many electrical concerns were unable to pay a dividend should spur all on to fresh endeavours. He endorsed all that had been said about co-operation. Another important form was with the employés—encouraging them to give better output. Bankers and financiers had slipped in between capital and labour. It was wrong for any individual able to buy in large quantities to give away the advantages thus secured at the expense of his fellow contractors.

A Proving House Needed

Mr. Harrison-Watson's paper, "Installation Problems Old and New" (see our last issue) was read on Thursday morning and, in opening the discussion, Mr. H. J. Cash, vice-chairman, I.E.E. Wiring Rules Committee, referred to the recent hair-dryer fatality, and said that a switch on such apparatus was likely to "let down" any contractor. The idea of a proving house for the electrical industry had been resuscitated, and there was some hope of its establishment. A previous attempt had failed because of expense. The present idea was that all existing organisations should be utilised, including the Standards Institution, testing bodies, &c. A separate proving house would not hamper the introduction of new designs, and it might be possible later to secure legal powers through the Commissioners.

Regarding the proposal to mark plugs, pressure from one quarter should be supported by representations from the E.C.A. to the B.E.A.M.A. Half of the trouble resulting from the use of several appliances from one socket was due to the movement to fix 15-A sockets for everything. Why should there not be two or three 1-kW points for heating instead of one 3-kW point. Many tests had been carried out on lead-sheathed systems for continuity, and in every case I.E.E. requirements had been met, but, of course, that only meant that the system was good with good workmanship. There were several instruments on the market for testing continuity easily, and he recommended every contractor to get one.

A letter from Mr. N. W. Gilbert, touching on the leak-trip apparatus, which he recently described in the ELECTRICAL REVIEW, was read. He asked what progress could be made if the contractors would not take steps to get the system adopted. Manufacturers would not exert themselves. A committee should be set up to decide what was to be done. Home Office authorities had had the matter under investigation and had given it unqualified approval.

Educating the Consumer

Mr. Ll. B. Atkinson, past chairman I.E.E. Wiring Rules Committee, asked if it would not be possible to bring home to consumers the need for employing responsible contractors, and suggested that it could be done through the medium of suitable insurance schemes. Trouble nowadays was brought about by the tremendous efforts that were being made to secure the domestic load. Supplies were afforded in small houses with all sorts of earthing points near at hand.

He thought the two-pin plug should be abandoned, and advocated sound earthing throughout. The 15-A plug should be used everywhere as the base, with a three-pin fused adaptor. He saw no objection to the use of plugs up to 5 A without switches; larger ones should incorporate them. He had been forced to reverse his opinion as to the need for a proving house, because of the flood of apparatus that was now sold through multiple stores, &c. The I.E.E. Committee was not wedded to the "substantial British" idea. Apparatus was not ruled out because it was too small, but because it would not meet the requirements of all members of the Committee, which included manufacturers, contractors, and consultants.

Mr. F. G. Quance (London) suggested positive and negative marks as in the old d.c. days for plugs, &c. Who would pay for the army of officials which would be required in connection with a proving house? The cost would be a burden on the industry. Manufacturers of standard articles were not well supported because of the slight extra cost.

Mr. W. Rawlings (the president's son) suggested that all apparatus should be marked for the switch wire. Appliances should not be sold which had no provision for suitable protection. Split plug pins made a tapered connection. With a whole-surface connection the diameter could probably be reduced by half.

Mr. J. D. Green said it was totally unsafe to have a three-heat switch on any portable apparatus. The only thing was to do away with switches on hair dryers altogether. A three-way plug with connections to a clock, a radio set, and a lamp standard could be a great deal safer than much ordinary wiring work.

Fear of what the other man might offer was the difficulty in producing the ideal installation foreseen by Mr. C. W. Sully (E.L.M.A.); that could only be overcome by co-operation.

Final Proceedings

After this discussion the business part of the conference was closed by votes of thanks, moved by the president, to all who had contributed to the success of the conference, including the Mayor and Corporation of Southport for the adequate accommodation they had provided for the meetings, &c., and by the installation of the new president, Mr. W. B. Williams (Bristol) and the appointment of Mr. H. J. Cash as vice-president.

In a short address the new president stressed the urgent need for the co-operation of manufacturer, supplier and contractor. While the object for all was the complete electrification of this country, each section was spending too much energy on doing the work of the others. He urged all members to take a greater part in the work of the Association and to attend the meetings as often as possible. The object of the E.C.A. was not to find jobs for officials. The founders knew there was much work to be done to improve the poor conditions in the industry. Contractors should regard the Association as part of their businesses. There was no contractor who was not reaping some benefits from the work of the E.C.A.

Mr. H. W. Roberts (G.E.C.) and Mrs. E. K. Muir
(Photograph by Mr. E. K. Muir
(J. H. Tucker & Co., Ltd.)

Mr. Cash said that since he was president eleven years ago he had not ceased to regard himself foremost as a member of the E.C.A. He was taking office again under a pressing request from the Council.

A pleasing event of the concluding proceedings was the presentation to Mr. Rawlings by Mr. Williams, on behalf of the Council, of a modern dress watch of unusual character as a mark of appreciation of the work which he had done during his year of office.

Many of the delegates stayed on to take advantage of various visits, drives, &c., which had been arranged. The outstanding event of the Friday was a visit organised by British Insulated Cables, Ltd., to their Prescot works and to Liverpool Cathedral. Those acquainted with the B.I. works will readily appreciate that a somewhat hurried tour through some of the shops in less than two hours could do little more than give the visitors a very general impression of the works as a whole; none the less, that impression could not be other than pleasing. Glimpses were gained of most of the cable-making operations, but the greatest attraction was the rolling out and coiling up of large diameter conductor from square section billets in practically one continuous process.

At luncheon at the Adelphi Hotel, Liverpool, Mr. G. H. Nisbett, managing director of the company, after welcoming the visitors, criticised the paper read by Mr. Marryat at the conference as being unduly pessimistic. While there were several million houses still unwired in this country, the contractors' prospects were good. In reply, Mr. W. R. Rawlings supported Mr. Nisbett's view.

Some of the E.C.A. Members and Their Friends at Southport

1. Messrs. H. J. Galliers, A. Roffey, W. E. Gallier, W. Lang, E. K. Muir and H. W. Scutts. 2. The President with Mrs. Mull-Firth and Mrs. Rawlings. 3. Messrs. W. J. Rawlings and C. W. Sully. 4. Messrs. A. Shelton, A. G. Bruty and W. F. Furse. 5. Messrs. W. Riggs, T. E. Alger and W. A. Shaw. 6. Messrs. W. H. Walton, H. J. Miles and W. R. Rawlings. 7. Messrs. C. B. Taylor, F. J. Hawkins and N. Aish. 8. Messrs. H. C. Hazel and W. J. Jones. 9. Messrs. W. Preston and "Bobby" Smith. 10. Messrs. F. Madge and G. R. Lusty. 11. Mr. W. B. Williams, the new president. 12. Messrs. A. Roffey and W. Riggs. 13. Messrs. R. and G. J. Berry.

Meetings in Paris

The International Electrical Congress and the Union of Producers and Distributors

LAST Monday evening saw the opening of the jubilee celebration of the first international electrical conference at which decisions were taken regarding the standardisation of electrical units. That was in 1881, but, in view of the Faraday centenary last year, the present congress was postponed until now. It has been organised under the auspices of the International Electro-technical Commission by La Société Française des Electriciens, La Société Française de Physique, Le Comité Electro-technique, Française, and l'Union des Syndicats de l'Electricité.

Upwards of 200 papers are being presented at the Congress, which will continue until July 12th. These fall into thirteen sections covering the whole field of electrical applications in their more scientific aspects. British contributors include Mr. H. Richardson (" Thermionic Phenomena "), Prof. N. da C. Andrade (" Light Rays "), Dr. E. H. Rayner (" Electrical Measurement "), Mr. H. W. Taylor (" Mechanical Design of Rotating Electrical Machinery "), Mr. K. R. Hopkirk (" Balancing of Electrical Machinery "), Mr. M. B. Hague (" Analytical Methods of Studying Magnetic Fields " and " Bibliographical Study of the Method of Symmetrical Co-ordinates "), Sir Philip Dawson (" Railway Electrification in Great Britain "), Mr. D. S. MacNaughtan (" Electro-deposition of Metals "), Mr. B. S. Cohen (" Special Tests in Telephony "), Mr. B. O. Anson (" Recent Progress in Automatic Telephony"), Prof. E. V. Appleton (" Wave Propagation "), Mr. M. Wilmotte (" Radio Transmission "), and Prof. C. L. Fortescue (" Electro-technical Training ").

The biennial congress of the International Union of Producers and Distributors of Electrical Energy opens to-day. Nearly forty set papers will be presented on the usual electricity supply questions and points for special discussion will be raised by the directing committees of the thirteen sections. No papers by British authors are announced. This congress will also terminate on July 12th.

The Mechanical Design of Rotating Electrical Machinery

The paper by Mr. H. W. Taylor (British Thomson-Houston Co., Ltd.), read at the I.E.C. Congress, reviews the development of rotating electrical machinery during the last fifty years, and discusses the mechanical design of the principal types and the stresses to which the component parts of the machines are subjected when in operation.

The author says that electric welding has resulted in the discontinuance of the use of castings in favour of electrically welded steel plate structures for most large stationary frames. Owing to the supposed weakness of a welded joint, the use of welded steel structures for rotating parts has not been so general, but in some cases it has been possible.

Rolled mild steel billet sections to which feet and lugs for bolting top and bottom halves together, and for other purposes, are electrically welded are now frequently used for the magnet frames of d.c. machines. Steel forgings are used in various forms for the rotors of all turbo-alternators, and in the author's opinion the development of larger machines, particularly for the higher speeds, is waiting upon the steel maker for the supply of more homogeneous and reliable material than can be obtained at present.

Centrifugal Stresses

Hoop or bursting stresses arising from the centrifugal forces generated in the rotating parts have to be given most serious consideration. The centrifugal force brought into play by the rotation of a pound weight at a foot radius and at a speed of 3,000 r.p.m. is just over 3,000 lb.

Probably for the reason that it gives rise to the minimum amount of indeterminate bending stress in the neighbourhood of the tooth tips, the most usual type of mechanical construction is the non-salient pole rotor with the windings placed in radial slots. The hoop stresses in the rotor may be estimated by considering a radial section as a disc of a diameter corresponding to the bottom of the slots with uniform external loading corresponding to the teeth and coils. In a large 3,000-r.p.m. rotor the stress at the inner bore may reach over 30,000 lb. per sq. in. at normal speed. Although by theory this value is a local intensification of stress towards the inner bore and can be reduced to approximately half if the material is allowed to remain continuous to the centre, designers consider it preferable to bore a hole along the centre of the forging to examine the material where it is most likely to be defective.

The most general practice in the construction of 3,000 to 3,600-r.p.m. rotors is to form the magnetic core and the shaft ends in a single solid forging of some alloy steel of which the principal alloy constituent is nickel, with chromium and also possibly molybdenum, each in smaller proportions. The possibility of designing more highly rated machines of this type seems to depend upon the steel maker and the forge master.

Other types of mechanical construction are possible for turbo-alternator rotors running at lower speeds, such as 1,800, 1,500, 1,200, and 1,000 r.p.m. Again, the non-salient pole magnetic structure is almost universally adopted at all these speeds. The construction frequently used for the highest ratings consists of a solid forging for the central magnetic body, separate forgings being used for the shaft ends. This is known as the three-piece shaft construction.

An alternative rotor construction is to use a number of discs as the magnetic core, these being formed into a mechanical structure either by mounting them with interference fits upon a central shaft, or by the use of through bolts of a high tensile alloy steel. In the latter case, the plate at each end of the rotor core is forged as an integral part of the ends of the shaft.

The rings which retain the end windings of turbo-alternator rotors are probably the most highly stressed parts of the machine. A nickel-manganese steel of austenitic characteristics, which is non-magnetic, has been developed for this purpose and can now be obtained with an ultimate strength up to 60 tons per sq. in. and with an elastic limit of 50 tons per sq. in. It has, also, the valuable property of being very ductile and will probably come into general use for retaining rings for all turbo-alternators.

Bending and Torsional Stresses

The maximum bending stress does not, as a rule, much exceed 2 tons per sq. in. Centrifugal stresses limit the diameter so that larger outputs can only be obtained by increasing the length, which in turn gives higher bending stresses. This limitation, with regard to a 3,000 to 3,600 r.p.m. alternator, seems to be in sight.

Associated with the bending of the shaft is the critical speed of the rotor. In general, the aim of the designers of electrical machines is to make the rotating structure stiff, by which is meant that the critical speed will be above the running speed. Practically all low-speed machines can be designed in this way, but with large output alternators running at the highest speeds it has been found impossible, with a diameter which keeps centrifugal stresses within reasonable limits and a length then chosen to give the required output, to design a shaft which is stiff. Experience seems to indicate that for such machines it is best to have the critical speed at least half the maximum emergency speed at which the machine is expected to run. As a rule, medium-speed turbo-alternators have stiff shafts, although some of the largest machines have been built with flexible shafts, having critical speeds in the neighbourhood of two-thirds of the normal running speed.

Abnormal conditions of service give rise to a torque very much above the normal and keys, shaft, and coupling bolts should be designed to resist these without deformation. These excessive torques impose a sudden change in speed on all the rotating parts and those which under normal operation do not assist in the transfer of the working torque will experience a tendency to move with reference to the rest of the rotating structure.

Steps can be taken when constructing the fabricated type to ensure in the frame of an a.c. machine stiffness with the minimum weight of material.

The Balancing of Electrical Machinery

The paper by Mr. K. R. Hopkirk (British Thomson-Houston Co., Ltd.), which Mr. Taylor also read, deals with the balancing of rotating machines by means of observations of the vibrations produced by unbalance on the non-rotating supports. It includes all types of support, and the theoretical results are confirmed by ten years' practical experience.

The fundamental connection between the eccentricity of each mass disposed along the length of the shaft and the periodic displacement of the support is found by considering the displacement of the support in a given transverse direction as the resolved component of a vector of constant magnitude, rotating at a constant speed. This leads to the expression of the support displacement in terms of the eccentricities of the various masses by means of a simple equation involving complex quantities. When a distributed mass is considered, it is necessary to know into how many short lengths it must be divided for the correction of eccentricity along the axis. This depends on the speed of rotation.

It is assumed that an instrument is available whose reading is proportional to the maximum value of the periodic displacement of the support to which it is attached. The reading can be made zero by adding weight in a suitable position. Vectors may thus be found representing the positions and values of the correcting weight to give zero readings, and from these vectors the position and value of unbalance may be calculated. It is, however, not always practicable to find these vectors directly, and a method is therefore given by which the vectors may be calculated from readings taken with a given weight in different positions on the rotor.

A discussion follows of the general laws relating to the vibrations of the supports to the unbalance forces producing them. Some useful relationships become apparent, and these are grouped under the title of laws of association. Intelligent application of the principles involved enables the problem of balancing to be quite simply and rapidly solved.

The paper then examines the problem of the multiple span shaft. First, the number of readings necessary and sufficient to determine the balance of each rotor completely is found, followed by a brief description of methods to be employed using the general principles described. Finally, a solution is given to determine the unbalance using a stroboscopic method, which is simple, but liable to certain errors.

The Southern's Extension

The first section of the Brighton electrification scheme opened

THE Southern Railway has by successive stages electrified practically the whole of its lines within thirty miles of London. This system consists of over 800 miles of track, forty-eight rotary convertor sub-stations containing over 200,000 kW of plant, and some 1,650 electrically operated coaches. The electrical services represent over 115,000,000 car miles, carry some 218,000,000 passengers, earn nearly £5,000,000 in receipts, and require for their operation some 326,000,000 kWh per annum.

The benefits to the public which have resulted from this great electrification in the way of increased, improved, and greatly accelerated services are to be extended to Three Bridges on July 17th, thus inaugurating the first stage of the Brighton and Worthing electrification scheme.

The present extension is, however, of a different nature, as it provides for the electrical operation not only of stopping services, but also of 550-ton 12-car corridor Pullman trains at the highest express speeds, to a distance of over 60 miles from London, and for that reason has presented entirely different problems of power supply and distribution, and rolling stock equipment.

The scheme involves the electrification of fifty-two miles of route (163 single-line miles of track), the construction of some fifty-two miles of 33,000-V transmission lines, eighteen remotely controlled rectifier sub-stations, the building and equipment of a large quantity of new rolling stock, the installation of colour light signalling, extensive improvements at stations, &c.

Rolling Stock

For semi-fast and stopping trains four-coach units with seventy first-class and 204 third-class seats will be employed, enabling trains to be formed of four, eight, and twelve vehicles. The coaches are new throughout and have been built in the company's workshops at Lancing and Eastleigh. Special attention has been given to the seats and upholstery, and the space given to each passenger is in keeping with main line standards. The underframes are constructed from steel sections, and the bodies have timber frames. Each unit includes a semi-corridor coach with first- and third-class lavatories, double sliding doors, and intermediate arm rests in the third-class compartments.

The electrical equipment of these trains is similar to that employed on the later designs of the company's existing electric rolling stock; the lighting and heating equipment has, however, been still further improved and electric water heaters of the geyser type, specially designed for the purpose, have been installed in the lavatory compartments of the corridor type vehicles.

Express Service Trains

Six-coach train units, each composed of five corridor coaches and one Pullman car, will be employed in these services, and two such units coupled to form a twelve-coach train will be used during the busy hours. The highest standards of comfort and finish have been adopted, and each Pullman car will contain an all-electric kitchen for the provision of meals and light refreshments. In addition, three special train units, each of five Pullman cars, are being constructed to form the "Southern Belle."

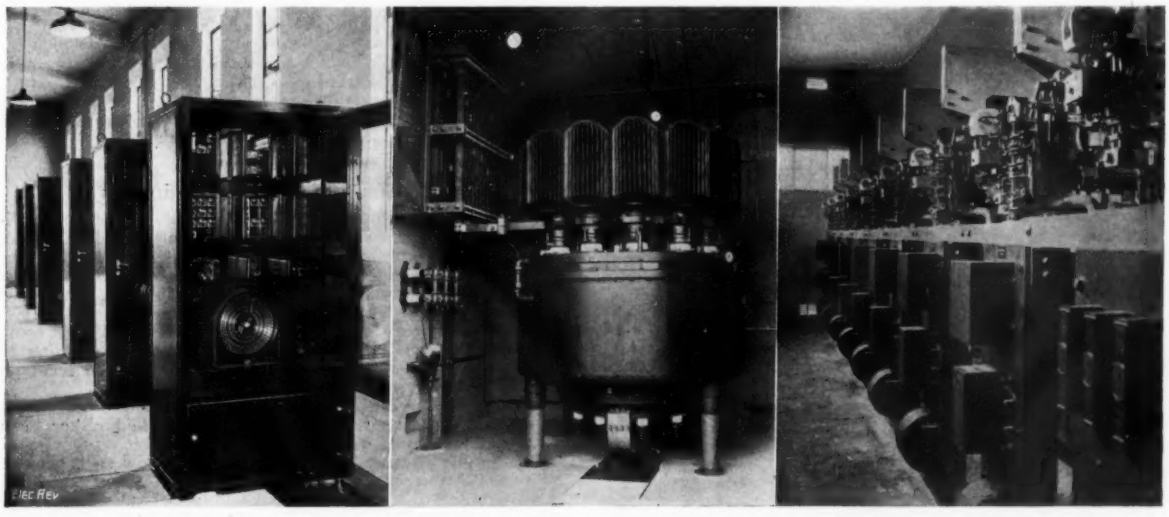
The electrical equipment has been designed to give a maximum service speed of 75 miles an hour. The end vehicles of each unit are motor coaches and are built with a driver's cab from which the whole of the motors on a train can be controlled. Each motor coach is mounted with four motors controlled through "Metrovick" switchgear of the electro-pneumatically operated type. Motor generators fitted with voltage regulators are carried on each motor coach for providing current at low voltage for the control and lighting circuits, and each of the Pullman kitchen cars will be fitted with a dynamotor to supply currents at low voltage for cooking, ventilating, and other auxiliary purposes.

One of the four-coach units

Power Supply and Distribution

North of Purley, trains will obtain power from existing sub-stations, in which additional rotary convertors have been installed; south of Purley power will be derived from the main transmission lines of the Central Board's grid system. Supplies at 33,000 V will be taken at Croydon, Three Bridges and Brighton. From these points power will be transmitted by specially designed 33,000-V cables to eighteen sub-stations along the line for the purpose of transforming, converting, and delivering it to the conductor rails.

Each of these outdoor sub-stations, which are of generally similar design, is arranged to receive duplicate supplies, which will be passed through A.S.E.A. oil circuit breakers to a Bruce Peebles transformer in which the pressure will be reduced from 33,000 to 690 V. This portion of the equipment is located outside the sub-station building. From the low-voltage side of the transformer the 690-V a.c. will be passed to a 2,500-kW Brown Boveri mercury arc rectifier situated within the sub-station building, by which it will be converted to direct current at 660 V and distributed through B.T.-H. high-speed circuit breakers to the conductor rails.



(Left): Remote-control equipment. (Centre and right): A rectifier and high-speed circuit breakers in a sub-station

The whole of these sub-stations will be unattended and remotely controlled from a central station (A.S.E.A.) at Three Bridges, from which every switch and circuit breaker on the system, of which there are about 350, can be opened or closed, and its position clearly indicated by coloured lights on the switchboard. At the same time measuring instruments on the board will show the amperage and voltage at every one of the controlled sub-stations. The whole of the operation, apart from the operator's initial movement, is entirely automatic.

Chloride batteries for the control circuits are normally trickle charged (Westinghouse), but can also be charged by motor-generators, one a.c. and one d.c. fed from the railway track. The grid sub-station switchgear (Reyrolle) at Three Bridges is housed in the railway control building.

Colour Light Signalling

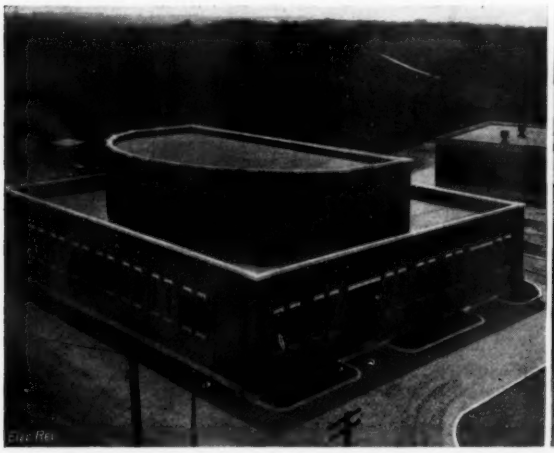
To ensure the punctual and uninterrupted operation of the greatly intensified train service which will be provided when

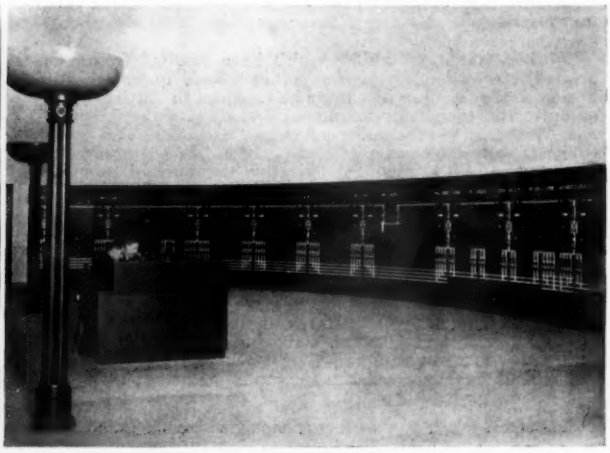
the Brighton electrification scheme is brought into operation, the line from Coulsdon to Brighton has been completely re-equipped with colour light signals of the type already installed on certain sections of the inner suburban area, which consist of groupings of red, yellow, and green lights that give the driver positive indication, according to their grouping at the moment, of the state of the line ahead. The intensity of the electric lighting, and the scientific colour composition of the glass employed for the lenses ensures clear visibility at all normal times, and, owing to the great penetrative power of the light, renders visibility possible during fog that would make ordinary signal arms and lights quite invisible.

(115 in all) will be operated by electric motors, and all the new signals will be of the colour light type. Including the twenty miles in the Brighton area, the new signalling installation will cover 119 miles of track, and when it is completed the Southern Railway Company will have nearly 200 track miles equipped with about 600 colour light signals.

Civil Engineering Works

Among the structural works undertaken in connection with this electrification may be mentioned the reconstruction of Haywards Heath station with four 800-ft. platforms, a new entrance and station buildings, and subway communication to plat-

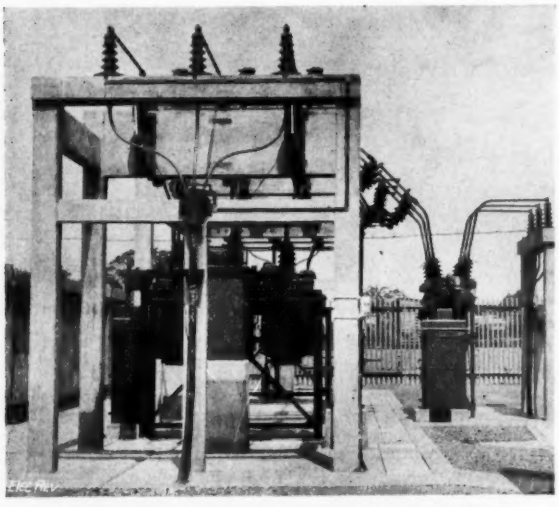




Two views of the main control room; there are no windows in the interior illustrated, and shadowless lighting is installed

Over long stretches of the line these signals are automatically operated by the passage of the train over the section in advance of the signal. Thus each train keeps the signal behind it at "Danger" until it has passed out of the section controlled by that signal into that controlled by the next, and, after that, at "Caution" until it has traversed the second section, when the first signal to be passed reverts to "Clear." Automatic signalling has made it possible to dispense with a number of intermediate signal boxes, only those at important junctions being retained. The signals controlled by these junction boxes embody the features mentioned above but are, in addition, manually controlled by levers operated by the signalman in order to enable him to hold any signal at danger. He cannot, however, give a "proceed" indication at any signal unless the line ahead is clear for the correct distance.

To enable the signalmen at the junction boxes to know exactly what trains are approaching on different lines, train describers of the magazine type are installed. They store the descriptions transmitted, the receiving end indicating in order the first three trains whose description has been stored by the signalman at the sending end. As each train passes, its description disappears and the next rotation takes its place.



The outdoor equipment of a typical sub-station

The D.P. Battery Co., Ltd., supplied all the batteries required for the new signalling equipment. At Three Bridges there is a 144-Ah battery, at Haywards Heath one of 144-Ah capacity, and a third is to be installed at Brighton next month, consisting of two batteries each of 500-Ah capacity.

Brighton station is being completely resignalled; the old equipment, operated from six separate boxes, will be superseded by a new fireproof 225-lever all-electric box. Many miles of point rodding and signal wires will be eliminated; the points

forms; the conversion of the Paint Shop at Brighton to a carriage-cleaning and inspection shed with twelve roads, seven of which have pits throughout, and with hot and cold water services, vacuum cleaning and carriage washing plant, &c.; the conversion of the old boiler shops at Brighton to a light carriage repair shop; and the erection and equipment of an 800-ft. cleaning and inspection shed at West Worthing.

The scheme of electrification was prepared and carried out by Mr. Alfred Raworth, the company's electrical engineer for new works, who has also been responsible for the design, lay-out, and installation of the whole of the electrical equipment. The rolling stock, apart from the electrical equipment, which has been Mr. Raworth's responsibility, has been designed by Mr. R. E. Maunsell, chief mechanical engineer, and the new signalling installation has been carried out by Col. G. L. Hall, assistant engineer (signals and telegraphs) under the general direction of Mr. G. Ellson, chief engineer, who has been responsible for all the civil engineering works.

Vibration of Overhead Conductors

AT the recent Summer Convention of the American Institute of Electrical Engineers, held at Cleveland, Ohio, many papers were presented relating to the vibration, fatigue, and stress-strain characteristics of transmission-line conductors. In one paper, according to *Electrical Engineering*, new types of conductors are advocated which would resist more successfully than ordinary sections (because of their shape or some inherent quality) vibration and the tendency to fail due to fatigue. The most favoured shapes are the twisted triangle, the twisted square, and the three-strand wire.

In nearly all recorded cases, breakage of strands has occurred adjacent to a support or at a joint which had either been improperly designed or applied. A method, therefore, which prevents any sharper bending of the conductor at a support or joint than occurs at the middle of a loop should eliminate breakage due to vibration. After a long series of experiments the Aluminium Company of America evolved a system for the protection of conductors against vibration in the form of "armour rods." The armour consists of a spiral layer of small round rods twisted around the cable for a short distance in the same direction of lay as the outside strands of the cable. Attachment of the line conductor to the insulators is made in the centre of the armoured length.

Included in the papers given at the Convention are the following results due to the studies on vibration:—

Reduction in tension will not prevent vibration and would be of value chiefly in decreasing the direct stress.

A properly designed damper will reduce the amplitude of vibration to an amount which is scarcely visible; it is required to absorb only a small amount of energy.

Experiments on eccentric cable shapes and cables of different stranding show that a rough exterior surface reduces amplitude, but do not indicate that a vibrationless cable can be evolved.

Armour rods are primarily reinforcement, although they reduce the amplitude of vibration by from 10 to 20 per cent.

Adequate practical protection against damage from vibration of conductors is afforded by proper use of armour rods or dampers.

The O.L.A. at Chesham

THE commons beyond Berkhamsted, together with Ashridge Park, now for the most part owned by the National Trust, form the most beautiful and largest chain of open spaces to the north of London. To this enchanting corner of the Chilterns nearly a hundred members of the Overhead Lines Association with their ladies and guests travelled by road and rail for the annual tour of the president's area of supply, which comprises some 84 square miles with a population of 40,000.

It consists of the urban districts of Chesham and Berkhamsted, the rural districts of Amersham, Berkhamsted, and parts of Watford, and the parishes of Sarratt, Chenies, Flaunden, Latimer, Amersham, Coleshill, Missenden (Little and Great), The Lee, Cartridge, Chesham Bois, Ashley Green, Northchurch, and Gaddesden (Little and Great), all of which parishes, except Flaunden and Sarratt, are served by overhead wood pole lines—48 route miles of high-voltage lines and 55 miles of low-voltage distributors.

The Chesham Electric Light and Power Co., Ltd., commenced operations in 1907 with the transfer of the Electric Lighting Order originally granted to the Urban District Council in 1901. Extension Orders were obtained in 1909 and 1928, and since October, 1925, energy has been purchased in bulk from the Metropolitan Electric Supply Co., Ltd., delivered at the southern extremity of the area at 33 kV, 3 phase, 50 cycles. Since local generation was discontinued the power station has become a service depôt and stores, and in the works yard the visitors had an opportunity of inspecting various types of pole arms and top brackets and the "Chesham" type of insulator. Distribution is being standardised at 11,000/400/230 V, some 15 brick-built sub-stations and 45 outdoor and pole-mounted transformer points being in use. Copper conductors are used, though "Copperweld" has been tried and some steel-cored copper spur lines are now being erected. Birds give little trouble, apart from nesting between the cooling pipes of pole-mounted transformers, and settling on line choke coils.

We illustrate examples of pole-line work in the district. The first picture shows a 0.1 sq. in. 3-phase line terminal pole with cable box connection to a main sub-station; 100-kVA 3-phase transformer at the pole foot, 3-phase switch-fuse and choke coils, lead-covered cambric transformer leads and sealing ends, s.p. overhead service line, l.v. fuse box, and underground cable to a pole in the road.

The second example is a 25-kVA 3-phase transformer with h.v. switch-fuse and four-wire l.v. distributors to a farm and cottages.

The third illustration shows a 50-kVA 3-phase transformer and "Copperweld" line serving a village, and the last is a three-phase 0.1 sq. in. copper line three-way switching station with double-pole switch and fuse for each direction.

Mr. R. J. Jocelyn Swan proved to be an untiring guide during the morning tour by motor coach of his southern area. Luncheon was served at the Town Hall, Chesham. Mr. Andrew Patterson, J.P., chairman of the Urban District Council, presided, and the guests included Major H. Richardson, O.B.E., M.C. ("Metesco") and Mr. Hugo Melzer, assistant engineer of the Municipal Electricity Department, City of Prague, Czecho-Slovakia.

In Ashridge Park

Mrs. Fennell, Mrs. Jocelyn Swan, Mr. W. Fennell (centre), and Major H. Richardson (light suit), are included in this group

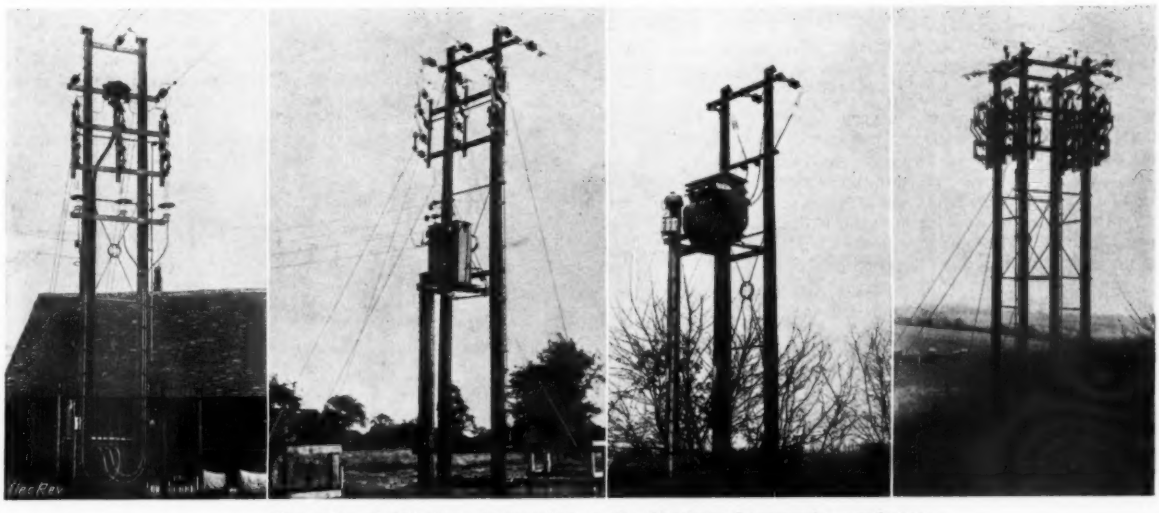
The afternoon was devoted to a circular tour of the company's northern area, including Ashridge House, which makes a maximum demand of 88 kVA (the installation was fully described in our issue of July 19th, 1929). This beautiful mansion, now the Bonar Law Memorial Political College, makes considerable use of electricity for illumination, cooking, laundry, and general domestic purposes. It is surrounded by famous gardens (where tea was served) and extensive grounds, and derives its water supply from the Little Gaddesden Water Co., whose old steam-driven beam engine pump (290 ft. deep) has been replaced after seventy years' work by a modern vertical automatically controlled motor pump.

Here also in the park the golf enthusiasts of the party spent the latter portion of the afternoon taking part in a competition organised by Mr. J. H. C. Brooking, for which several prizes were awarded. The cup was won by Mr. Reginald Cox (Yorkshire Switchgear Co.). Mr. Griffiths, the holder of the cup, did not compete this year.

Industrial Fuel Economy

THE 1932 issue of the *Fuel Economy Review* of the Federation of British industries contains a number of articles on various aspects of fuel and power practice, including not only surveys of progress in relation to the preparation and treatment of coal, but also authoritative contributions on practical subjects. For instance, the losses which result from the use of low power factor apparatus are not generally realised, and Mr. D. B. Hoseason's article on "Power Factor and Coal," in which these losses are quantified in respect of motors, distributors, transformers, transmission lines, and generators, is of considerable interest. Mr. Hoseason deals with the principal methods by which low power factor may be corrected, the types of plant available for this purpose, their advantages and limitations, and the savings which can be effected in the power bill by taking advantage of a power factor tariff.

The mechanical and thermal aspects of the furnace wall is the subject of a valuable contribution by Sir Robert Hadfield and Mr. R. J. Sarjant. Mr. W. Newton Booth, assistant mechanical engineer of Woolwich Arsenal, contributes an article on the application of air preheaters to industrial steam raising plants, and "Some Aspects of the Chemistry of Boiler Water" are dealt with by Mr. H. E. Jones (I.C.I.).

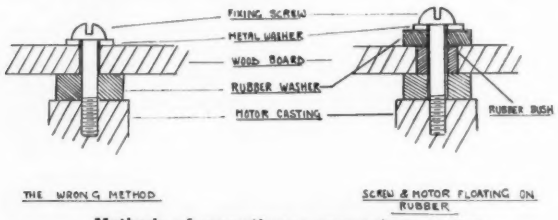


Examples of pole-line construction in the Chesham Company's rural area

The Electric Gramophone. By S. F. Philpott, A.M.I.E.E.

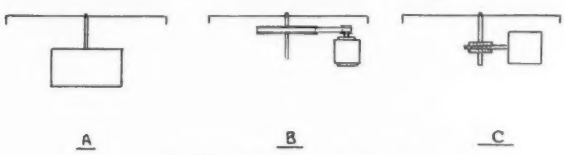
Methods of driving the turntable

THE earliest gramophones, or phonographs, were driven by low-voltage electric motors. Owing to the undeveloped state and consequent unreliability of the electric motor and accumulator at that time they were superseded by the spring or clockwork motor, which even now enjoys considerable popularity, particularly in acoustic gramophones. The modern radio-gramophone is always fitted with a mains-driven electric turntable motor, which rotates the turntable at a constant speed, irrespective of the load on the needle and of fluctuations in the supply voltage. The slightest speed variation is very noticeable in the quality of the reproduced music.



Methods of mounting a gramophone motor

The speed of rotation of almost all present-day records is 78 r.p.m., but adjustment must be provided so that records made at other speeds can be played. The speed range is usually from 70 to 90 r.p.m., and the motor must not depart from the selected speed throughout the playing of the record. The power required to drive the record past the needle varies widely. Heavy passages demand more power than light ones, because of the increased "wobble" of the sound grooves, and less power is required as the needle approaches the centre of the record, on account of the gradual decrease in torque.



Applications of electric drive

The Garrard universal model

Power Required

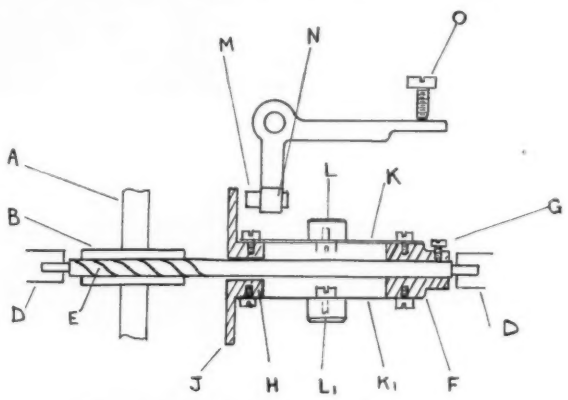
The worst possible case is a very heavy note or passage occurring at the outside of the sound track of a 12 in. record. This calls for a motor power of the order of 10 ft.-lb. per min., *i.e.*, 10/33,000 h.p. Average passages call for only 5 ft.-lb. per min.; 3 ft.-lb. per min. is all that is necessary for playing the inner grooves of the disc if not unduly heavy. Thus the motor has to maintain a constant speed with a load variation of over 300 per cent.! For this reason it is necessary to supplement the electrical driving unit by some form of centrifugal absorption governor, except in the case of turntables driven by synchronous motors, the speed of which is inherently constant whatever the load.

In practice it is usual to allow a percentage over the maximum power required to cover contingencies such as driving home-recording outfits or record-changing gear, and most motors give an output of at least 16 ft.-lb. per min. at the turntable. Some give more, but this is likely to strain the governor mechanism, which has to absorb all power above that taken to drive at the particular note being played. Another form of unsteadiness which has to be guarded against is tremolo, that is, rapid and continuous variation in speed. This may be caused by faulty gearing or "cogging" of the driving motor, or by bad governing.

Mounting Methods

The motor must run without a trace of noise or magnetic hum, and its mounting must be insulated acoustically (usually by rubber spacing washers) from the cabinet in which it is fitted. The wrong and right methods of insulating a motor are illustrated; in the former case, although rubber washers are provided, sound is readily conveyed to the board through the fixing screws, but in the correct arrangement the motor is completely insulated in rubber.

Temperature rise must be low. Most turntables are mounted in wooden cabinets and excess of heat may cause trouble due to warping and shrinkage; if the turntable becomes even slightly warm it will cause warping of records. It is impossible to sell a motor for gramophone use having a temperature rise of 40 or 50 deg. C., as allowed by the British Standard Specification, and generally a motor showing a rise of 30 deg. is considered "hot" by the trade. Some gramophone motors, such as those used in restaurants, work day in and day out; others in domestic machines have only infrequent use. Lubrication must therefore be as simple as possible. Oil or grease impregnated felt lubricators are most favoured, and will act for long periods without attention. Ball bearings are out of the question on account of the noise set up in the smaller sizes.

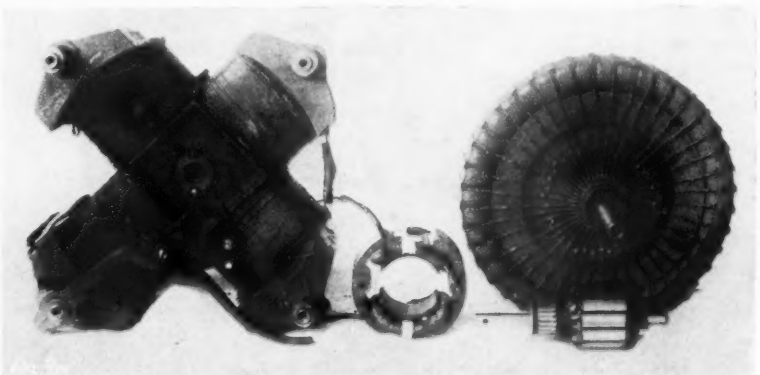


The principle of the centrifugal governor

Types of Motor

The requirements of the electric turntable drive having been outlined, it remains to consider how these are met in practice. An electric gramophone consists of three essential units, viz., the turntable which carries the record, the driving motor, and the speed-regulating mechanism.

The turntable is a simple steel pressing, faced with plush or velvet. The driving motor may be a series-wound commutator motor, in which case it is suitable for either direct or alter-



Ancient and modern motors in contrast

nating current, a squirrel-cage induction motor, or a synchronous machine.

Mass production of the motors and of the gramophones calls for a wide range of voltage and frequency. Generally a "universal" type of motor is required to work at any pressure between 100 and 250 V on d.c. or a.c. with a frequency between 25 and 60. Induction motors are required to cover the same voltage range, but the frequency is usually limited to between 40 and 60, or sometimes to 50 cycles only in the standard model.

The commutator type of motor suffers from the disadvantage that any sparking set up by the brush gear will be reproduced in the loud speaker of the instrument. The brush gear is also liable to cause mechanical noise, and so the speed of this class of motor is always low; in order to effect this and to give the voltage range demanded, the universal motor is fitted with a variable series resistance, the position of the slider for various supplies being engraved on a scale. The magnetic density in the poles and the armature reactance voltage are kept low.

Systems of Driving and Governing

The induction motor is invariably of the squirrel-cage pattern with salient poles having shading rings to give the necessary starting torque. No series resistance is necessary, and one winding suffices for the whole voltage range. The windings are usually in parallel for from 100 to 130 V and in series for the higher range. These motors are robust in construction, cheap to build, and permit of a fair range of speed regulation. The synchronous type of motor is similar to that used in electric clocks, but develops a greater torque. Many forms of coupling between the motor and the turntable have been used from time to time, some of which are illustrated. In A the motor runs at 78 r.p.m. and is mounted directly on the turntable spindle. This form is the most silent of all, but the motor is necessarily large on account of the slow speed and therefore costly. The starting torque is often poor compared with other types. It can be adapted for commutator, squirrel-cage, or synchronous motors.

In the form shown at B the motor drives the turntable by means of a rubber or fabric belt. This permits of a smaller motor and gives a silent drive. The use of a fabric belt makes it necessary to pivot the motor to maintain the belt tension. Owing to the small arc embraced by the belt, it is not desirable to go above a ratio of about 4 to 1. Thus the motor speed is only 300 r.p.m. This is suitable for commutator motor drives, where a slow armature speed is necessary to prevent brush noise, &c.

In the drive shown at C, a worm is provided on the motor spindle and a fibre gear on the turntable spindle. This gives a compact arrangement, as the motor is horizontal and permits the use of a high speed motor, and is suitable for induction or synchronous motors having a rotor speed of about 1,200 r.p.m. The gear drive is more noisy than the others, but with care can be made to operate satisfactorily.

The speeds of universal and induction motors are controlled by means of a Pickering type of centrifugal governor, driven from a gear on the turntable spindle. The speed of the synchronous type of motor is fixed by the supply frequency and is independent of the load and incapable of variation by the user.

In the illustration of the principle of the centrifugal governor A is a portion of the turntable spindle and B a gear mounted upon it. C is a spindle running in bearings D, on one end of which is worm E; this spindle is driven by the turntable spindle. F is a brass sleeve fixed to the spindle by set screw G. H is another sleeve free to slide on the spindle. J is a brass disc integral with H. K K_1 are flat springs secured at each end to the sleeves F and H and having balls L L_1 fixed to their centre. Generally three balls and springs are employed, but only two are shown here to make the illustration clearer. M is a pad of felt fixed in clip N, the position of which in relation to disc J can be varied by turning screw O.

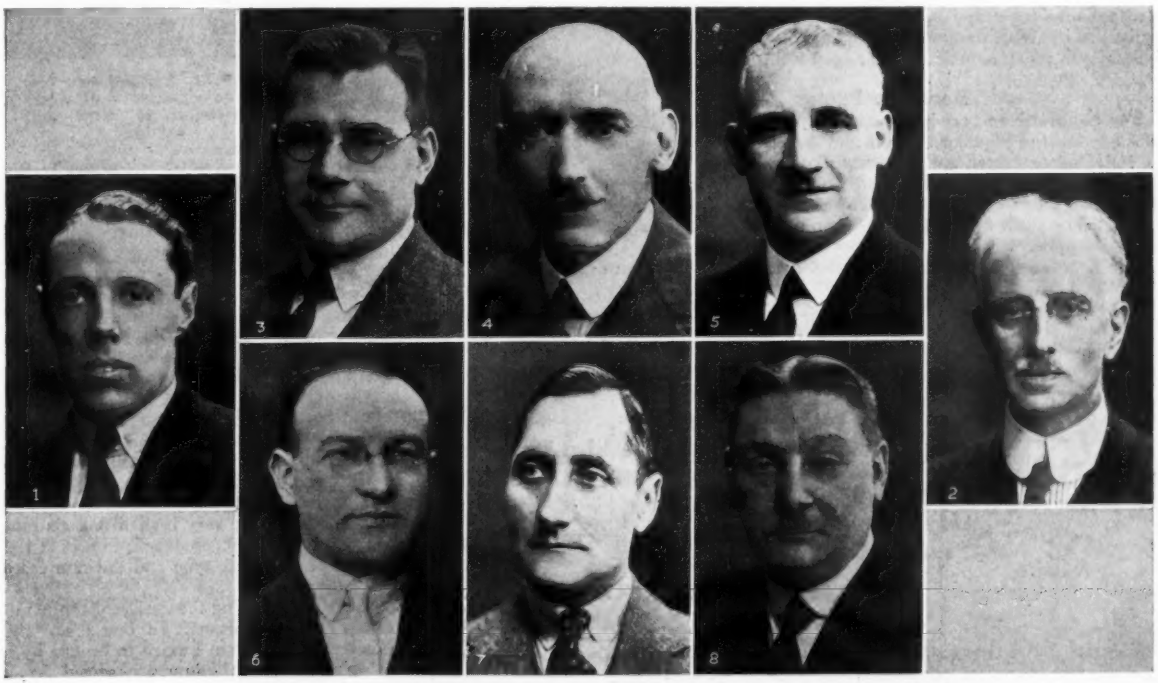
The action of the device is as follows: When the turntable is rotated by the motor, the spindle C and the complete governor assembly revolve at high speed, and the balls are thrown outwards due to centrifugal force. This causes movable sleeve H to be drawn inwards and disc J to make contact with felt pad M, thereby applying a brake to the turntable. If the motor speeds up the balls fly out still farther, and cause the disc to be drawn more tightly against the felt pad thereby applying a heavier braking effect. Similarly if the motor tends to slow down due to additional load on the turntable the balls recede slightly and the disc moves away from the brake pad.

Ensuring Uniform Speed

By suitable design of the various components of the governor, a constant turntable speed can be obtained over a very wide range of load variation. The optimum speed at which the governor maintains the speed of the turntable can be varied by altering the position of the brake pad relative to the disc, that is, by adjusting screw O.

In the illustration of the Garrard universal model the motor proper is seen on the left; it is of the series commutator type and runs at approximately 320 r.p.m., driving the turntable by a fabric belt, not visible. The motor is pivoted and a spring maintains the belt tension. The governor and speed regulating mechanism are in the foreground. The whole motor is mounted on the nickelled steel plate seen below the turntable, but is acoustically insulated from it by rubber bushes.

The voltage across the motor is 40 on d.c. and 90 on a.c. supplies. The difference between this and the mains voltage is absorbed in a series resistance. The last illustration shows the armature and field of an Edison phonograph motor made in 1890, and the same components of the model just described.



Some Driving Forces in the Industry: Nalder Bros. & Thompson, Ltd.

1. Mr. D. Nalder, joint works manager. 2. Mr. H. Baggett, joint works manager. 3. Mr. A. B. Gibbons, assistant manager. 4. Mr. A. F. Harris, chairman and managing director. 5. Mr. A. G. O'Neill, assistant manager. 6. Mr. C. Lipman, technical engineer. 7. Mr. J. S. Hart, accountant. 8. Mr. J. A. Jarritt, sales manager. (*Photographs by Albert Hester.*)

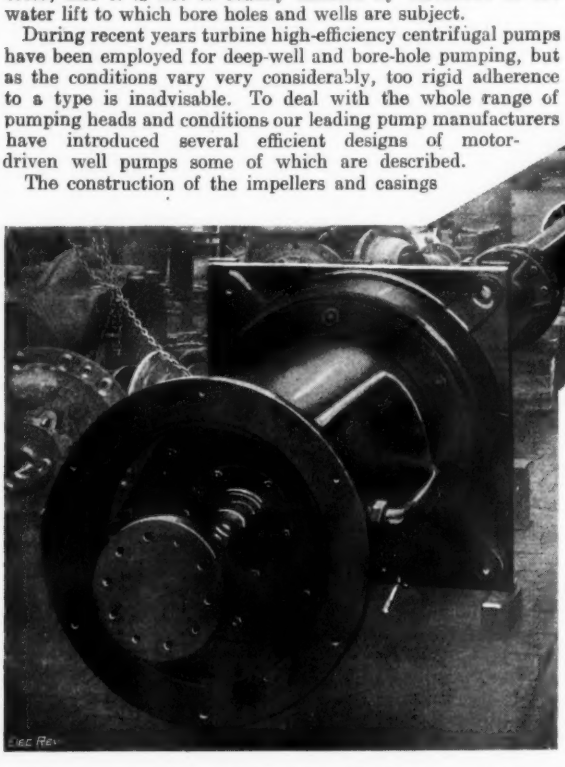
Electrically Driven Pumps. By F. J. Garland

Special designs for deep-well and high-lift supply

FOR large powers and high heads the reciprocating pump is often better than the rotary type as, although it may cost more, it has usually a longer life and lower running costs; also it is not so readily affected by variations in the water lift to which bore holes and wells are subject.

During recent years turbine high-efficiency centrifugal pumps have been employed for deep-well and bore-hole pumping, but as the conditions vary very considerably, too rigid adherence to a type is inadvisable. To deal with the whole range of pumping heads and conditions our leading pump manufacturers have introduced several efficient designs of motor-driven well pumps some of which are described.

The construction of the impellers and casings



A " Radiflo " multi-stage high-lift pump

differs in the various makes. The " Radiflo " motor-driven type is an adaptation of the multi-stage high-lift pump. This unit is comparatively large in diameter and is suitable for high total heads and usually does not require any form of booster pump.

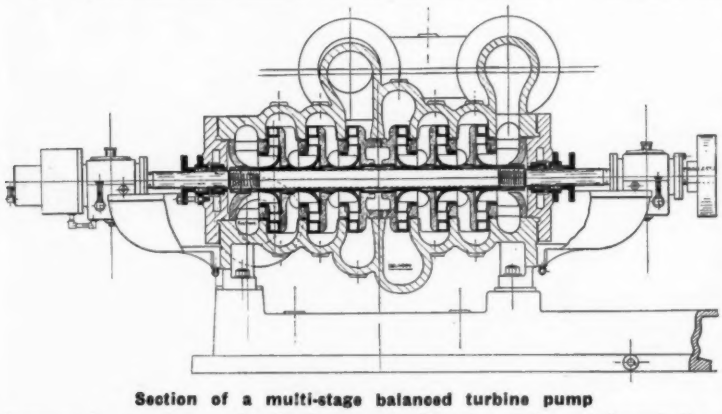
The " Coniflo " type of pump is for wells of not less than 12 in. in diameter in which the impeller is of a conoid form, combining a certain amount of radial flow with the axial flow, and generating a higher head, the impeller being in practically hydraulic balance and the thrust load light. Both these types are by Worthington-Simpson, who have also introduced several designs on similar lines for deep well duty.

Bore-hole Pumps

The motor-driven bore-hole pump employing a hydraulically efficient form of impeller blade is now a most satisfactory unit. It can be constructed so compactly as to permit of its installation in the smallest bore-hole; it can also be designed to deal with water carrying sand in suspension, in which case the delivery shaft and bearings are protected by a steel shaft tunnel supplied with clean water.

For a given bore-hole diameter the capacity of the pump increases in accordance with the increase in diameter of the impeller. When delivering, say, 30,000 g.p.h. the pump efficiency would be about 70 per cent., and well-designed bore-hole pumps may generally be relied on to obtain the maximum yield from small bores; this may in some cases obviate the expense of additional sinking operations. Where the water in the well is within suction distance of the surface, pumps of the split-casing multi-stage balanced turbine type may be used, with half the impellers of one hand and half of the other, the whole of the rotating portion being in axial balance, no hydraulic plate being necessary.

In a design for raising 830 g.p.m. against 650 lb. at 2,920 r.p.m., by Hathorn, Davey & Co., of which a section is illustrated, end thrust is neutralised by reversing the flow through certain stages.



Section of a multi-stage balanced turbine pump

A Modern Turbine Pump

A typical deep-well installation on modern lines was made not long ago in which a 100-h.p. turbine pump was placed 290 ft. down in a 30-in. bore-hole through a long vertical shaft. The turbine runs at 1,000 r.p.m., with 8 in. suction and six phosphor-bronze, 15-in. impellers in series. The pump casing is of castiron; the guide vanes have renewable bronze rings, and the impellers run in rubber-lined gunmetal rings.

The weight of the moving parts of the impellers is balanced by the head of water when the pump is running. The high-tensile steel driving shaft runs down the centre of the rising column, and has a bearing at each end of the main joints consisting of a spider centred in sockets in the pipe flanges and bushed with gunmetal. In sinking this well, the tool was lost at over 700 ft., and two years elapsed before it was recovered.

As there is room in a bore-hole for a single leg only, the work done on the up-and-down strokes is balanced by a ram working in a top piece of half the bucket area, flanked by two air-loaded rams, the pressure on which can be so adjusted that both the dead load and the inertia can be made sensibly uniform.

Mr. F. J. Garland has had a wide experience of water engineering at home and overseas

Large Ram Pumps

Electrically driven high-lift ram pumps of large size have reached an efficiency of about 94 per cent., according to the duty. A foreign installation, which comprises two units of quadruple-acting rams, is pumping 580 g.p.m. per pump in one direct lift to 4,337 ft., probably the highest duty yet attained in water-supply practice. The efficiency of the pumps and motor is over 90 per cent.

For heavy-pumping duty the five-bearing three-throw ram pump is being applied. A recent example showed 94 per cent. efficiency after a year's run. These types are strongly built, the rate of delivery is steady, and vibration in the rising main is almost absent, the plant being provided with suitable air vessels and alleviator. For this type a squirrel-cage motor, in conjunction with a starting by-pass, is generally suitable.

In the horizontally split type of multi-stage turbine pump, the end-thrust is neutralised by reducing it to that due to one impeller; this is brought about by reversing the flow through certain stages, and the use of a balance plate is thus avoided. For very high lifts a six-ram design pump has been produced, in which the valves are of the mitre type and the ram cases are of mild steel.

For high-lift pumping the design of the pump valves is very important. In one make the load is transferred from bronze to bronze by a " V " ring, but the joints are sealed by a leather ring, which gives a " stream line " flow through the valves; the seat is held down by a simple claw.

There is no doubt as to the future of electricity in its application to pumping operations.

Domestic Water Heating. By D. J. Bolton

Characteristics and economics of the load

WATER heating, like cooking, is an all-the-year-round load and extends for severals hours after the inhabitants are in bed. No two users have the same schedule, and with the delaying effect of thermostatic control the demand can be spread and diversified almost indefinitely. In proportion to the capital and maintenance charges on plant the load is probably the largest in actual magnitude, with the possible exception of space heating. It is possible to charge the consumer a rate which on the whole is no higher than he must pay for equal service by any alternative system, and which provides a fair margin of return to the electricity supply undertaking.

The outstanding service of electrical storage water heaters is that thoroughly hot water is instantly and always available at the tap without labour or the necessity for previous thought. It is a service which is equalled by few gas systems and still fewer independent boilers or kitchen ranges. Electrical installations substituted for a rival system have been used two or three times as often as their predecessors, simply because of their outstanding convenience.

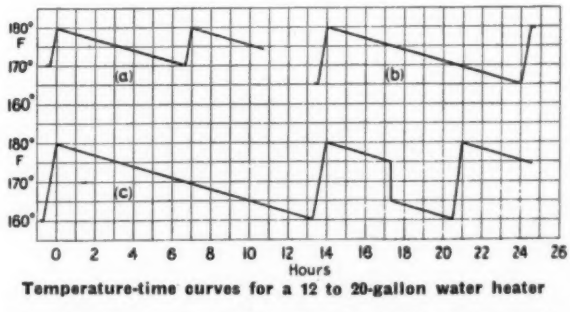
The "Reymez" pedestal wash-basin

In the average kitchen a kettle of water is kept on and off the boil for hours a day merely to provide comparatively small quantities of cooking and washing-up water when needed. Apart from the low thermal efficiency of an externally heated kettle, the quantity is often wrongly estimated and much of it is wasted. With a small electric water heater mounted close to the sink the correct amount is drawn off when and as it is needed, and the daily over-all efficiency may work out at ninety instead of about nine per cent.

An example of a compact water heater for a hand basin which avoids unnecessary piping and pipe losses is illustrated. The electrical equipment is by Messrs. A. Reyrolle & Co., Ltd. The base of the pedestal contains a fully lagged water heater with automatic temperature control. The hot tap which is placed in the normal position on the side of the basin supplies cold water to the tank, displacing hot water which runs up and out of the centre spout.

Standby Losses and Working Costs

The stand-by losses from the boilers at present on the market in this country are extremely small. Using an empirical constant, depending on the temperature differences, the figure worked out at 5.5 kWh per week for a three-gallon heater and 13 kWh for a 20-gallon size. Test results on actual heaters have substantiated these figures. It is therefore possible to say to a consumer having a unit rate of ¾d. that the



Temperature-time curves for a 12 to 20-gallon water heater

cost of having twenty gallons of nearly boiling water at his command day and night is about 10d. a week. If he forgets to switch it off before starting for his fortnight's holiday the mistake will cost him only 1s. 8d.

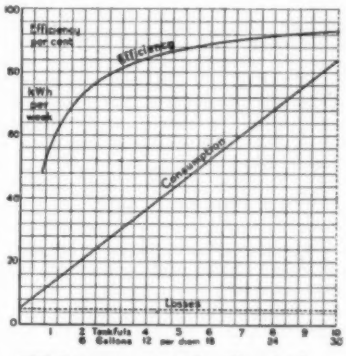
A three-gallon heater with a 500-W element is capable of giving ten tankfuls, i.e., 30 gallons of hot water a day, and using the above figure for the losses the full load efficiency works out at 93 per cent. Even when giving only one-fifth of its maximum output (i.e., six gallons a day) the efficiency is 74 per cent., at which point two gallons of water at 180°F. are given for 1 kWh (see curve below). This efficiency refers to the heater only, but as this is mounted close to its job there would be no pipe losses. A 20-gallon tank showed a maximum efficiency of 96 per cent., and an output of 2¼ gallons per kWh when giving one-fifth of its maximum output.

Working costs apart from stand-by losses will depend entirely on the amount of water used. Wherever there is a secondary tariff of between ¼d. and ¾d. per kWh (and to a lesser extent from ¾d. to 1d.) the electrical method, if properly planned, is absolutely competitive in running costs. But, and this is a vital point, it is essential that the whole system shall be designed on lines which suit electric heating and not merely copied from or grafted on to an existing fuel-fired system.

Electric heating is capable of very precise and automatic control, and it can be expanded or contracted with the minimum of loss to suit the fluctuations of demand. But if it is used indiscriminately to provide large amounts of heat independent of actual needs and to scatter these over long lengths of pipe in the manner of many fuel-fired systems the result will be disastrous. Not only must the scheme be planned electrically, but the consumer must use it electrically and not carry over the bad habits of a former regime. He must not try to obtain three or four baths in succession on one night of the week, but must spread his schedule to suit a smaller tank with a slower recovery rate, giving a maximum of two baths in quick succession.

Magnitude of Load

In order to get an idea of the magnitude of the water heater load a few typical installations can be considered. It will be assumed that the thermostat is set to cut out at 180° F., at which temperature water drawn from the top of the tank is delivered, and that the inlet temperature is 54° F. (the yearly mean figure for the Metropolitan Water Board's mains).



Efficiency curve of 3-gallon tank

Installation A consists of a 1½- to 3-gal. displacement type heater with a 500-W loading mounted near and used in conjunction with a sink or hand basin or both. Installation B consists of a 12-gal. heater of the pressure type supplying a bath, sink and basin. This is the smallest size which can be recommended for bathroom supply, since the whole tankful when diluted with cold water at 54° will give a 30-gallon bath at 105° F. Installation C consists of a 20-gal. heater with a 2-kW loading and is intended for a larger house. It will give two small baths in succession, or a really luxurious one. The efficiency assumed is 2.2 gallons per kWh.

The energy and other costs per quarter are set out in the accompanying table for two different unit rates and for typical hire charges. The figures refer to water at 180° F., and for most purposes this will be diluted with an equal or greater quantity of cold. On the other hand they refer to the total quantity of hot water leaving the tank, not that issuing from the tap. The results agree with the experience of a number of undertakings.

		A	B	C
Size of heater (gals.)		1½–3	12	20
Used for		Sink and/or basin.	Bath, etc., 3 or 4 baths per week.	Bath, etc., 1 bath per day.
Daily water consumption (galls. at 180° F.).	Sink, etc.	6	6	6
	Bath	0	6	12
	Total	6	12	18
Yearly energy consumption (kWh)		1,000	2,000	3,000
Quarterly hire charges		4/–	7/–	10/–
Quarterly energy at ¼d. and ¾d.		10/5 15/8	21/– 31/3	31/3 47/–
Element rating (kW)		0.5	1.0	2.0
Yearly load factor (per cent.)		23	23	17½

The Price of Energy

Consider an undertaking buying at a grid tariff of, say, £3 5s. to £3 10s. per kW plus 0.22d. per kWh. The costs of distribution affect the unit charge only to the extent of the transmission losses, which average 14 per cent. for the whole

country. The running cost (distributed) would thus be about 0.25d. per kWh. Any purely off-peak load such as night heating, or any load which can be guaranteed not to affect the peak either on the station or on the street mains, could therefore be quoted at any figure above 0.3d. and show a profit.

The fixed charge for the distributed energy will be between two and three times the bulk tariff, and all loads not inherently off-peak must pay some share of this. Now the individual load factor of a single water heater will be of the order of 20 to 25 per cent. But when grouped together or added to other domestic or power loads, water heaters will improve the general load factor to a far greater extent than is indicated by these figures. Moreover, in the case of a two-part or two-rate domestic tariff a large proportion of the standing costs of distribution are covered by the fixed charge or high lighting rate. The *extra* fixed costs, due purely to the connection of water heaters, can be taken as about equal to the grid charge on the additional kW of, say, £3 5s. per annum. Reckoning this at an equivalent load factor of 20 to 30 per cent., and adding also the unit charge of 0.25d., the overall unit charge is from 0.55d. to 0.7d. per kWh.

Whether such figures as these for the secondary portion of a domestic tariff can safely be reduced (with apparatus connected throughout the twenty-four hours) depends on the extent to which such apparatus can be regarded as unlikely to come on to the station peak.

The water heating peak comes in the morning and not in the afternon when the station peak usually occurs. Since the switching is automatic and a function of temperature, there can be no guarantee that the heating load will not come on at all during the peak, and individual heaters may cut in at any moment during the day. But in view of the chief uses to which hot water is put there seems a strong *à priori* reason for supposing that their smallest consumption will occur on the station peak.

Size of Element

The supply engineer prefers a low rating which will be in circuit more frequently or for a longer time. It has been shown that a 12-gal. heater which is emptied once a day uses about 2,000 kWh a year. If the element has a 1-kW rating the load factor of the apparatus will be 23 per cent.; if a 2-kW element is fitted the load factor will be 11½ per cent., just half as good, but there is probably very little difference to the supply main between them.

If one hundred such heaters are installed in one street, and the thermostat differential is 15°F., when no water is taken the heater will switch in about once every nine hours. The only difference between a 1-kW and a 2-kW element is that the switching-in period would last about 30 minutes instead of 15 minutes. Since the actual moment of switching in would depend on the law of chance there would on the average be almost a perfect diversity between the hundred heaters, and it is doubtful if a meter reading on the street mains would show any difference between the two cases.

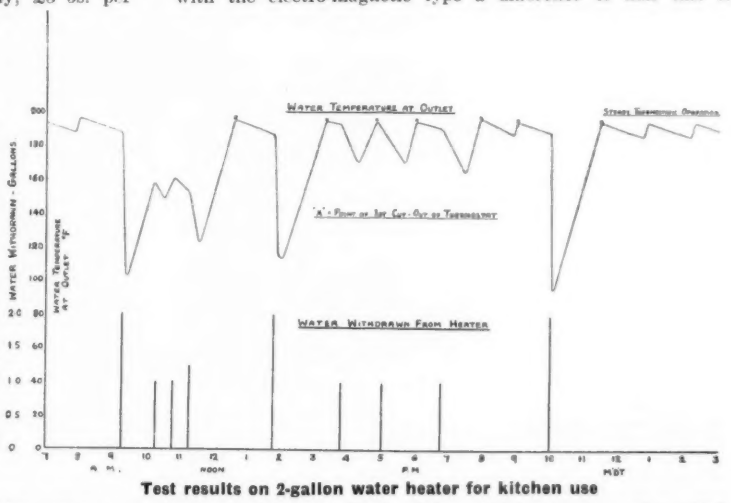
When in use the thermostats would cut in when about 1½ gallons were taken, or less if the tank had been cooling for some time and had come nearer to its natural cutting-in point. The time for which the heater would then be in circuit would depend on the amount of water taken, but would be half as long with the 2-kW as with the 1-kW element. If everyone used their heaters at the same time there would be a considerable advantage in the low rating, but with the diversity likely in practice the difference would be very slight. There may even be occasions when bigger elements would be advantageous; thus with the higher rating, heaters used for mid-day washing up are less likely to be still in circuit when the late afternoon peak comes on.

Summing up, it may be surmised that, though it is a sound general principle to install low-rated long-period apparatus, in the case of thermal storage heaters it is probable that an increase of, say, 50 per cent. in the loading of a given size of tank would make little difference to the aggregate demand.

There is some gain to the consumer in a higher loading, as though his normal use will hardly be affected, there may be occasions when he wants to use it heavily or in rapid succession.

Thermostat Differential

The usual type of mercury-in-glass thermostat is not often satisfactory with a differential of less than 10° to 15° F., but with the electro-magnetic type a difference of half this is quite practicable. If the differential is too close, the switch will be continually coming in and out especially on small heaters, and may even chatter; there is also a danger of the water boiling due to incomplete mixing. On the other hand, if the differential is too great the service is poorer, since the mean temperature is reduced and the temperature fluctuates unduly. The writer has tested a small heater in which the differential was as great as 45°F. The rest period was then fifteen hours, and if water happened to be drawn off just before the end of this the temperature was too low for satisfactory washing up.



Test results on 2-gallon water heater for kitchen use

The hypothetical temperature-time curves given are for a medium-sized heater (12- to 20-gal.) having a cooling rate of 1.5° F. per hour. Three different differentials are illustrated, namely, (a) 10° F., (b) 15° F., and (c) 20° F. In the last case the result is also shown of drawing off a small quantity of water in the middle of the cooling period. Had slightly more water been taken, the thermostat would have cut straight in and so altered the sequence of the curve. The test result on a 2-gal. heater for kitchen use is shown above. A certain schedule of water consumption was followed (as shown at the bottom of the figure) amounting to six complete tankfuls a day. Owing to the small size of the tank the cooling rate is comparatively high (6½° per hour), and as the differential is a close one (8° F.) the thermostat is operating more frequently than usual.

A much-debated point is the effect of differential setting on time incidence of the load. It has been suggested that, if the differential is fairly large, drawing off a small quantity of water, e.g., for afternoon tea, will not bring in the heater, and that it will normally be out, say, from 3 p.m. to 6 p.m. If this applied to, say, 80 per cent. of the heaters on the system it would be an important point in fixing both the differential and the tariff. The general opinion appears to be that a differential of about 15° F. gives a satisfactory working compromise. The usual cooling rates are from 4°F. down to 1°F. per hour, the rate getting smaller as the tank gets larger, and when water is not being used there will be a rest period of from four to fifteen hours between thermostat operations. With the normal element loadings the cutting-in periods will be of fifteen to thirty minutes' duration.

If the house wiring is on the light side extra cabling may be necessary in order to avoid affecting the lights when the thermostat cuts in and out. The larger the element and the more frequent the switching the greater will this trouble become.

The "bright lights" at the E.C.A. Conference
(from Mrs. Ll. B. Atkinson)

Insulated Wire Manufacture. By F. A. Middleton

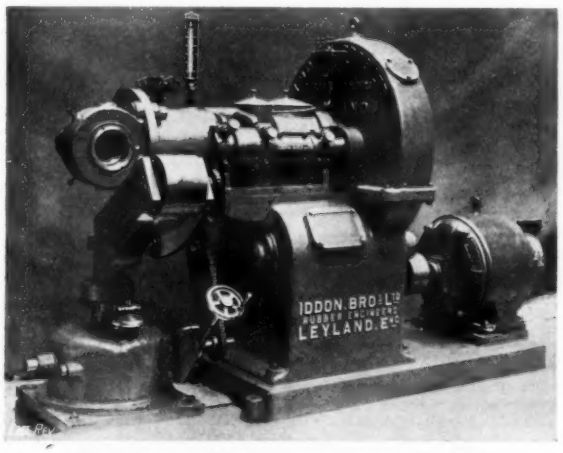
The processes involved in rubber covering

THE processes carried out in a rubber works aim, briefly, at destroying the tackiness and plastic flow which render rubber a useless commodity in its natural state. This object is achieved by plasticising the gum between the rollers of a mill, and incorporating sulphur while it is in this semi-fluid condition. The application of heat for accurately prescribed times and at carefully devised temperatures then produces a substance—vulcanised rubber—of great elasticity and resilience, enhanced tensile strength, and no adhesiveness.

With the sulphur, various ingredients may be incorporated to give the final product various desired properties. Zinc oxide, carbon black, colloidal clays, and many other chemicals increase the tensile strength, while there is a class of compounds called "fillers"—such as french chalk, barytes, and whiting—which are entirely neutral and serve only to cheapen the mixture. Finally, a comparatively recent development is the introduction of a number of organic "accelerators," which permit the time of vulcanisation to be shortened considerably.

In the manufacture of a rubber-covered cable the strands of the copper conductor are thoroughly tinned, for copper induces rapid deterioration of rubber. Surrounding the conductor is a thin layer of almost pure rubber, having a small proportion of sulphur (about 2 per cent.), which, in turn, is sheathed in a layer of white rubber, containing such a reinforcing material as zinc oxide, for strength and good heat conductivity.

In the early days of the industry this white layer was designed to remain only semi-vulcanised, to constitute a transition stage between the pure rubber layer inside (which does not vulcanise) and the outside layer, which is black, of excellent physical properties, and completely vulcanised. Now, however, the two sorts are of similar construction, and form a homogeneous mass on vulcanisation.

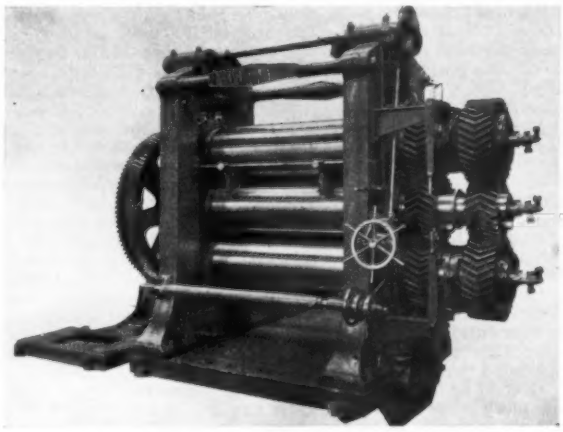


Extruding machine: conveyor gear on left

Covering the Conductor

There are three methods by which rubber insulation is applied to a conductor—extrusion, longitudinal covering, and lapping. Whichever method is employed, absolute uniformity of thickness is essential.

The machine for extrusion employs a screw, or worm, to force the soft unvulcanised rubber-mix through a conical guider on to the conductor, and the insulated conductor passes through a die which controls the overall diameter of the cable. Despite its apparent simplicity, this method entails accurate adjustment of die and guider to ensure absolute centralisation, and the uniformity of the rubber mixing, the speed of transit of the wire, and the working temperature are all important factors in the quality of the final product. The machine must be carefully designed to ensure such definite relations between the sizes of die, guider, and worm, and the speed of the machine as will ensure the smoothest working.

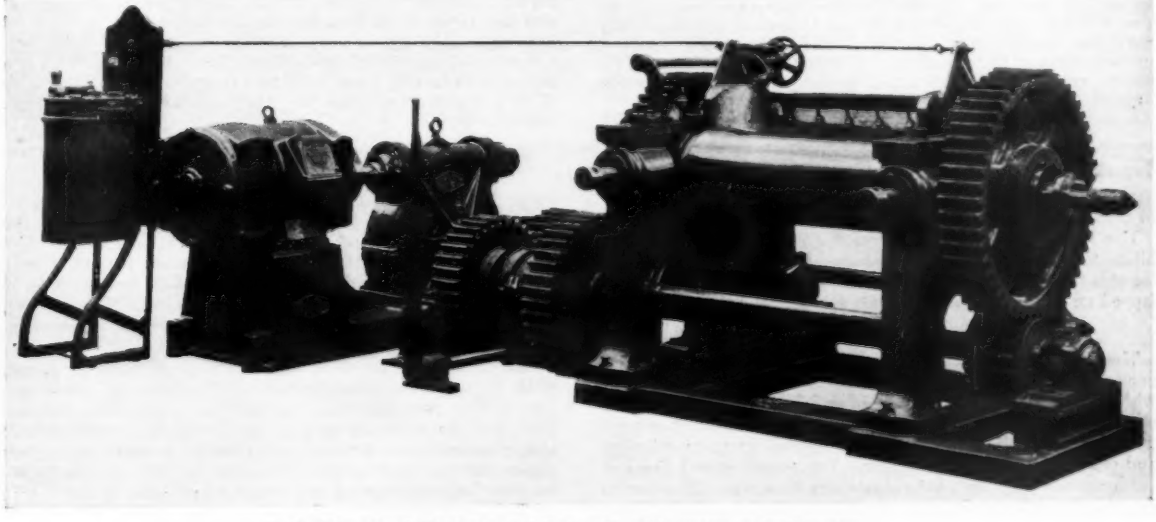


A three-bowl calender, showing wind-up gear

In longitudinal covering the copper wire is run between a pair of grooved rollers, which are set so that grooves coincide with grooves, and flanges with flanges. Two strips of rubber travel along with the wire, one above and the other below it; and as the three pass between the rollers, the flanges press the strips round the wire, cutting the edge of each rubber strip. The cutting action, owing to the tackiness of the rubber at this stage (it is unvulcanised as yet) has the effect of sealing the joins. By using three sets of rollers, it is possible to apply the three coverings already referred to in one machine.

The rubber strips used in this method are prepared with the aid of a machine called a calender. It consists of three rollers (or bowls) set one above the other. The middle one rotates in an opposite direction to the other two, while the top roll revolves at a slightly lower rate than the others. Rubber in the warm plastic state in which it comes from the mixing mill is fed between the top and middle rolls, whose distance apart is regulated for the thickness of strip required. The greater speed and temperature of the middle one ensure that the thin wide wall of gum shall adhere to it sufficiently to be carried round to the bottom roll, from which it is wound in cloth. A cutting machine then divides the broad length of rubber into strips of the required width. The most careful

(*Continued at the foot of page* 52)



A double-geared Robinson mixing mill with worm reduction gear

New Books

Instruction Sheets for the General Shop: Electricity. By MELVIN S. LEWIS and JOHN H. DILLON. Pp. 91; Illus. London: McGraw-Hill Publishing Co. Price 3s.

The title does not give much indication to the English reader of the contents. The book contains a series of standardised lessons in elementary electrical matters, outlining a course of instruction for schoolboys or for junior apprentices. It opens, after the preface, with a "Teachers' Guide," explaining to the "teachers" how the book should be used, and following this are ten "instruction sheets," each dealing with some particular electrical job, such as "To wire up a door bell or buzzer using one push button and one dry cell," or "To wire up a 110-V circuit of one fuse block, one snap switch, and one light receptacle."

The whole tenor of the book implies that the teaching of the subject can be standardised to a degree that would not, we think, be approved by even an elementary schoolmaster, whilst the descriptions of the materials and the work done are quite foreign to English practice. For example, Instruction Sheet 6 refers to the use of "metal conduit for electrical wiring." Three systems of conduit are mentioned, viz., "rigid conduit, flexible conduit, and ornamental conduit." Of these only "rigid conduit" is used here, and this is dealt with thus: "Rigid conduit is more difficult to handle than flexible or ornamental conduit and requires special tools, such as pipe cutters, pipe dies, pipe wrenches, etc. For this reason your (the pupil's) exercises will include only work with armoured cable on ornamental conduit."

It is to be feared that a book that deals in this way with the most important wiring system in use in this country will not be of much service to anyone concerned with electrical wiring over here, though it may be of great value where the methods of installation correspond with those described in the book.

Hydraulics. By E. H. LEWITT. 4th edition. Pp. xii+272. London: Sir Isaac Pitman. Price 10s. 6d.

In no small way the utility of this book is due to the requirements of technical correspondence and other schools for a low-priced, simply written work covering the syllabuses of the A.M.Inst.C.E., A.M.I.Mech.E., and B.Sc. (Eng.) examinations in hydraulics. The four editions, a second reprint, and the addition of new matter well abreast of the time give ample proof of the book's value. Many of the subjects coming within one or other of the various professional examination syllabuses call for a similar work. The publishers of this book are already well to the fore in this respect, but there is much more to be done along these lines.

The author is a teacher of experience, and he writes with adequate knowledge and ability to make the subject clear and interesting to the reader. Many examples and model solutions with figures are given to illustrate a point or help the student over a difficulty. Credit is due to both writer and publisher, and the book is recommended to the attention of all candidates for the above-mentioned examinations.

Artificial Light and its Application in the Home. Pp. viii+145. Illus. London: McGraw-Hill Publishing Co., Ltd. Price 9s.

This book has been prepared by a committee of the American Illuminating Engineering Society, and twelve authors have collaborated in producing its eight chapters, containing altogether some 30,000 words. The aim has been to bring the principles of good lighting before "the man in the street" in a simple and yet effective manner so that mistakes may be avoided and the possibilities of modern lighting practice and equipment more fully appreciated.

This aim, on the whole, has been achieved. The many full-page illustrations are particularly valuable, especially those in Chapter VIII, which deals with "Lighting the Rooms of the Home." The salient points made in each chapter are emphasised by means of a series of questions brought together at the end of the book. To the English reader the book suffers from the inevitable disadvantage that it deals exclusively with conditions as they exist in the United States. The chapter on incandescent lamps and wiring would need modification in several respects before it could be accepted as a guide to English practice.

A dictionary of illumination terms forms a useful appendix to the book. It is, however, surprising to find the statement that the adaptation of the eye to the brightness of the field in view "is accomplished by the opening or closing of the iris" (p. 129). Further, the definition of the inverse-square law ends with a reference to the "simpler *flux-of-light* method, *q.v.*," but no explanation of this method appears in the book. The paper and printing are excellent, and so is the index; in fact, the publishers have done their work well.

Shorter Notices

"The S.A. Mining and Engineering Year Book," 40th edition. Pp. 524; illus. 9 in. × 13 in. Price 21s. (in England 22s. 6d.). "The Rhodesian Mining and Engineering Year Book, 1932." Pp. 292; illus. Price 10s. 6d. (12s. 6d. in England). South Africa: S.A. Mining Journal Syndicate, Johannesburg. London: Argus South African Newspapers. The first half of each of these books is the year book section and contains a large number of articles dealing with the industries of the districts concerned. The second half is in the form of a directory and gives particulars of mining industrial and financial companies, the names and addresses of mines in Rhodesia, South Africa, South West Africa and Tanganyika. There are also lists of consulting engineers, geologists, government departments, public bodies, and principal engineering concerns. One section is a buyer's guide to the suppliers of the requirements of engineering, electrical, constructional, and mining material trades. A number of map supplements are included.

"Kelly's Directory of Merchants, Manufacturers, and Shippers of the World." Vol. I. Pp. cccxlvi+2,375. Vol. II. Pp. cvii+2,190. London: Kelly's Directories, Ltd. Price £3 4s. The contents of this work are so well known in the commercial world that they need little mention. In addition to more than one and a half million names, covering over 20,000 places, the book contains innumerable useful facts and figures. Volume I deals with foreign countries and their possessions, and Volume II with Great Britain and the Empire. The work is fully indexed in four languages.

"Electrical Machinery and Apparatus Manufacture." Edited by Philip Kemp. London: Sir Isaac Pitman & Sons. Price 6s. per volume. Vol. V (pp. ix+309; figs. 87) deals with electric furnace construction, testing, and accumulators. Vol. VI (pp. ix+237; figs. 67) is the final volume of the series, and deals with turbo-alternators and telegraph apparatus. There are 1,600 pages in all.

"Tin Solders," by S. J. Nightingale. Pp. 90; illustrated. London: British Non-ferrous Metals Research Association. Price 5s. This book describes the results of recent research and the light they throw on the day-to-day problems of the plumber, electrician, and other craftsmen who utilise solders. The properties of the solders and their choice for particular applications are fully dealt with.

"Willing's Press Guide, 1931." Pp. xii+498. London: Willing & Co., Ltd. Price 2s. 6d. The fifty-ninth annual issue of this useful publication contains, in compact form, a comprehensive index of the Press of Great Britain, Northern Ireland, and the Irish Free State, together with the principal Colonial and foreign publications. The work has been entirely revised.

"Elektrotechnicka Rocenka Esc, 1932" (Electrical Year Book of the E.S.C., 1932). Edited by Ing. B. Parez. Pp. 320; illus. Prague: Czechoslovak Electrical Association, Vocelova ulice 3, Prague XII. Price Kc. 200.

"The Causes of Accidents," by Eric Farmer. Pp. 88. London. Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. A reprint of three lectures on recent research into the causes of accidents given at the Royal Society of Arts.

"Electrons and Waves," by H. S. Allen. Pp. 336; illustrated. London: Macmillan & Co., Ltd. Among the subjects treated in this work are relativity, the quantum theory, photo-electricity, the atom, X-rays, radioactivity, the spectra, and the theory of de Broglié.

"Osiris and the Atom," by J. G. Crowther. Pp. 221. London: George Routledge & Sons, Ltd. Price 5s. This is a collection of essays, intended to be a record of the more striking of recent advances in science; they are written in a simple, interesting style.

Insulated Wire Manufacture (*Continued from page 51*)

handling in every stage of this process is essential, in order to preserve the correct degree of tackiness.

The lapping process is reserved for cables whose size prohibits the use of the longitudinal method. Strips of rubber for this process are prepared in the manner described, and are lapped on to the wire as it travels along.

Vulcanising the Insulation

The final stage in cable insulating is perhaps the most important. This is the vulcanisation of the product, without which rubber would have no commercial value whatever. The most efficient method is to bring the rubber into direct contact with dry steam, by winding it on a padded drum or cylinder, and placing in a vulcanising oven. Temperatures and times of vulcanisation vary with individual manufacturers. The former are usually between 280 deg. F. and 300 deg. F., and a given temperature must be maintained for any length of time up to, say, one hour and a half, according to the thickness of the covering.

When the cable is too large or too long to permit of only one layer round the drum, it is embedded in french chalk in a pan and the whole consigned to the vulcaniser. This method, however, involves a number of difficulties of heat penetration, besides demanding great care in the prevention of steam condensation and the decentralisation of the conductor by reason of its own weight. Improvements in the design of vulcanisers have gone a great way in mitigating the nuisance of condensation, but the disadvantages of the french-chalk method are still observable in porosity, pitted surfaces, and inconsistent vulcanisation. Such cables, of course, do not come on to the market, but they are an ever-present incentive in the search for improved methods.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A Water-heating Suggestion

Many interesting suggestions have been made from time to time, in your Correspondence columns, as to ways and means of meeting the disadvantages of the electric hot plate, in its present state of development, for water heating. These include the combination of gas with electricity, the kettle with the cooker, &c.

It is becoming generally recognised that the most economic method of heating water electrically is to heat it by an appliance specially made for the purpose. This has the further advantage that it gives a hot water service as distinct from hot water. It would appear that decided advantages could be obtained by, in effect, combining the kettle with the small water heater usually found in the kitchen of the all-electric house. Absolutely boiling water is generally only required in the small kitchen for the making of tea in small quantities and generally in a hurry. A 1-kW element will bring four pints of water, already raised to about 175 deg. F. in the water heater, to the boil in slightly over three minutes.

Would it not be possible, therefore, to attach to the standard small water heater a subsidiary tank, to hold three or four pints of water, with an element of 1 kW loading or less, into which water, which was required at a boiling temperature, could be drawn. This tank should not add materially to the cost of the heater as a whole, and need not therefore be lagged, nor be fitted with a thermostat. All that would appear to be necessary would be a simple float valve, as fixed on the conventional gas geysers, to prevent the element being burned out by the boiling away of the water.

Such a piece of apparatus would be at least as economical as the electric kettle and much quicker, and not the least amongst its advantages would be that the network of flexible leads in the kitchen would be reduced by one. The difficulties and disadvantages of the pure geyser type of heater are here greatly reduced and no doubt the manufacturers could overcome any difficulties in producing a reliable article, but so far as I am aware there are no such heaters on the market at present.

Dublin, *June 30th* C. P. O'CONNOR.

E.H.P. Switchgear

The question of the design of an oil switch to perform definite functions has been raised by many of your contributors. The majority of these statements, it would appear, are influenced by trade considerations, which, in effect, frequently eliminate the sound scientific theories and practice from the design in question. Most designers can produce an oil switch that will perform satisfactorily the services needed, whether it be 50,000 kVA or a million kVA, but, if they are associated with large combine interests, the identity in design is not always revealed.

It is common knowledge, and within my experience, that the designer's ideas and principles under such conditions become obscured while the product is travelling through the many departments, including the sales department, which frequently removes the basic principles for commercial reasons, and this may be the chief cause of complaint by some of your contributors.

All the data that is necessary for the design of such a switch is available, and supported by tests carried out at various periods. Personally, I am not in favour of a proving house, nor am I in sympathy with any combine measures of action on the contributory principle. I have had some experience with the latter, which in effect results in the major interests becoming predominant throughout to the disadvantage and expense of some other smaller contributors.

The most successful designs are produced by the firms who are under direct control, with their designers acting in a similar capacity, and which undoubtedly produce more efficient and more enterprising results. Such firms are in a position to develop the talents of their staff for the benefit of the industry which is not the case with the others.

A. G. COLLIS,
Technical Director, Standard Switchgear, Ltd.
Hornchurch, Essex, *June 28th*.

Britain's Electrical Future

The challenging article by "Forty Years" (why a nom-de-plume?) prompts me to add a few observations with regard to the sub-paragraph "Decision or Drift ?"

Let me remind the author that "drift" was the policy which compelled the passing of the 1919 Act and it gave an opportunity for "decision" by the formation of Joint Electricity Authorities for the whole of Great Britain, but "drift" continued and so the Government made a "decision" with regard to generation and passed the 1926 Act.

May I digress here for a moment and refer to the phrase "cheap and abundant" which has been so bandied about. In the 1919 Act it is provided that the duty of a Joint Electricity Authority is "*to provide or secure the provision of a cheap and abundant supply of electricity*"—note the alternative "secure the provision" and that it is Joint Electricity Authorities which are charged with this duty. The words are so often stupidly and inappropriately applied that a reminder of their precise origin appears desirable.

To revert to the immediate subject of this communication: supply authorities have allowed the generation to drift out of their control and unless they bestir themselves distribution will go the same way. The country having been partitioned up into districts for the Board's schemes, an excellent opportunity is available to set up Joint Electricity Authorities under the 1919 Act to coincide with the Board's districts. Under the 1919 Act alone generation and distribution would have been controlled and although as a result of the 1926 Act distribution is only now available, the 19— Act will sweep this away if "drift" continues.

Personally, I am satisfied that such difficulties as there are can be surmounted, but will the industry take command of the helm and steer its own course, or will it "drift" until towed into port as treasure trove by its captors? It cannot be allowed to be wrecked. We may lament the failure of the Lausanne Conference, we look forward in expectation to Ottawa, but how futile to expect our statesmen to come to agreement with colonial and foreign representatives when even one of our great industries is unable to arrive at agreement. We throw out our chests and say that England leads

The Electrical Contractors at Southport: The centre of the group posing for the official photograph

the world—yes, we certainly have given the world a lead on dis-agreements, and a pretty mess the world is in at the present time.

The grid is an accomplished fact, and its success is our success. Are we of the supply industry going to throw away the success by our failure to get together? I mean "get together" in every sense of those words; no jealousies, no narrow or parochial outlook, no robbing Peter to pay Paul—a fair and square deal for all, whether it be shareholder, employé or consumer. I have indicated a means by which it can be done, provided there is an honest and genuine endeavour to do it. In the words of your contributor, is it to be "Decision or Drift"?

FREDK. W. PURSE.

London, S.W.1, *July 4th.*

The E.L.M.A. Agreement

The E.L.M.A. agreement forms are with us again, and with them the list of E.L.M.A. Rules.

As a firm believer in the trading policy of this Association, I feel that it is making a grave mistake in asking people to confine themselves to lamps of E.L.M.A. make. There are thousands of consumers who feel they cannot afford to pay the extra for Association lamps, and *won't* pay it: therefore Association supporters have to send custom away from their own doors to the shops of competitors who are, presumably, E.L.M.A.'s enemies. Why cannot the Association leave it to its supporters to sell E.L.M.A. lamps wherever they possibly can, and make it worth their while, with increasing "gradings," to take time to educate their customers to the value of such lamps?

This year, it is quite evident that there is to be severe competition in the lamp trade, and traders cannot afford to send away customers who refuse to buy Association lamps. The alternative is to sign the E.L.M.A. agreement, with no intention of keeping the rules, or refuse to sign it, and lose, perhaps, 7½ per cent. on E.L.M.A. turnover, trusting to make it up on the other lamps.

I trust that some of your readers will express their views on this subject: they will be none the worse for an airing, and should prove advantageous to all of us.

B. FORREST.

Glasgow, *June 25th.* (A. & B. Forrest & Co.)

The Private Plant

In your issue of June 24th you published a letter from Mr. Clarke, engineer and manager of the Newry U.D.C. Electricity Department, which mainly sets out to discredit certain figures given by Mr. W. A. Tookey in his article which appeared in the ELECTRICAL REVIEW of June 17th. Mr. Clarke chooses to refer to Mr. Tookey's fuel consumption figure of 0.61 lb. per kWh in connection with a 50-kW Diesel-electric set operating at 66 per cent. load as "fantastic" and considers that 0.8 lb. would be a good result from a well-maintained plant of that size.

We should like to confirm Mr. Tookey's figure as being correct and within the guarantee figure of any first-class maker of oil-engine plant of moderate speed (solid injection) with a direct-coupled electric generator operating at 66 per cent. load.

We disagree also with Mr. Clarke's statement that the modern Diesel plant cannot be relied upon for more than fifteen years. We have a number of oil engines installed fifteen years ago which are good for another fifteen years' work. In some cases oil engines have been operated day and night (120 hours a week) for the past seven or eight years (equal to eighteen years' working on ordinary day load) and the only replaced parts of any moment have been new liners and pistons. The useful life of well-made oil-engine plant is fully equal to that of any steam plant.

Mr. Clarke's criticism clearly proves him to be afraid of private users installing their own power generating plant and so he seeks to discredit figures given by so eminent an authority as Mr. Tookey.

CROSSLEY BROS., LTD.

Jas. G. Walthew, *Sales Manager.*

Openshaw, Manchester, *July 4th.*

Sydney Harbour Bridge Shocks

With reference to the letter from "N. S." which appeared in your issue of June 3rd, the shocks experienced on Sydney Harbour Bridge were probably caused by the exhaust from petrol engines. Such shocks are well known to occur from steam cars by the "Armstrong effect"; indeed, I believe steam cars are provided with means to prevent them.

The water vapour in the exhaust of the petrol engine probably provides the charge as it escapes from the nozzle. The shocks were felt on the bridge because there the men were in contact with earth.

C. TURNBULL.

Tynemouth, *July 1st.*

"British Made"

Your correspondent, Mr. G. F. Sills, appears to have only a hazy idea, in common with a few other unfortunate people, of what the British Empire really consists.

It is a mournful fact that Mr. Sills should consider that advantages will only accrue to this country by buying products made in Great Britain. If this attitude were to be generally adopted, we should probably soon find ourselves staring at more and more idle machinery hitherto utilised in manufacturing material for our Colonies. It should be clearly understood that any Empire product is just as much British as an article made in England.

Recently the Mayor of Wigan said, "Let us start with goods made in Wigan first." When is this nonsense going to end? For heaven's sake let us sell our goods because they are the best and cheapest, and return to sanity.

H. CONSTAD.

London, S.E.1, *July 2nd.*

"The Fire was Caused By . . . ."

THE careful attention that is now being given to so-called electrically caused fires has been left rather late, but it is nevertheless very welcome. It would be to the advantage of the electrical industry if contractors would take careful note of the loose statements made in the Press from time to time and if it happens to be one of their jobs that is referred to, to take legal advice to see if an action for libel would lie.

Having said this much, I ask: Are we, in the electrical industry, doing our part as thoroughly as possible? There are grave doubts. The recent fire in the Portsmouth supply area seems to furnish a case in point. In the first place, to run twin wiring under cleats is asking for trouble. The pressure necessary to retain the cables in position is an undue strain on the insulation, and a short circuit is certain to occur sooner or later.

The statement that the switch was off means nothing, for the "short" may have occurred some time before the fire had got a thorough hold. The accumulation of inflammable rubbish between the cables and the pier deck is not an excuse—it is an admission of slackness on somebody's part. This question of twin and three-core cables, particularly tough rubber sheathed ones, calls for careful attention. The sub. fuses on the circuits may easily be heavier than the conductors—due to the "handy" man—and when a fault, such as we are discussing, arises, the trouble, having been sown, is reaped. The writer was once told that "ninety per cent. of electrical troubles exist only in the minds of electrical men." From what has been seen during thirty years' experience that is about right. But that does not relieve us of the duty of keeping it so.

A Horrible Example

To anyone observant, potential danger can be seen very often—happily it remains potential—but there is a limit. In the basement of a large house not a thousand miles from Euston Road on removing a cupboard door, two very old type porcelain cut-outs, innocent of covers, were found nestling comfortably in a maze of gas pipes and gas meters. Flexible wire festooned ungracefully round a gas pipe was found to be alive through defective insulation. The writer was told that these things were beyond the business in hand and attention could not be considered—"the lights were quite all right." In those areas of supply in London which may be referred to as the "pioneer" areas there are many old jobs still in use, principally in wood casing. The covering on the cables is no longer insulation, and when the premises concerned become damp there is, of course, a fire danger.

The matters dealt with so far are concerned with bona-fide installations whose real fault is antiquity. But there is another and more definite menace. I refer to the "smatterer," a relation probably of the "kerbstoner," of whom we are not hearing so much these days. Now the "smatterer" is the individual who for threepence per week is regaled with much "advanced" electrical "knowledge" in one or other of the journals devoted to broadcasting. Having paid this premium and been made "wise," a certain store which shall be nameless undertakes to supply the material in multiples of six-pennyworths. Thus, covered steel wire wedged between the joints of floor boards was found to be supplying bedroom heating points, with a 3-kW fire as "portable heating."

The myriad of extra points and switching run in "red and black" flexible wiring would surprise many of our supply engineers—the flexible in itself, of course, not being necessarily dangerous. It is the almost universal tendency to wind it round gas pipes that is so amazing. This subject could, of course, be continued indefinitely. What is to be done? More inspectors? The electrical industry is for ever looking for a new stranglehold to put upon itself, but that does not appear to cut much ice in view of what has been referred to.

Local authorities have certain departments (not electrical) which possess powers to enforce the removal or abatement of a nuisance or danger. The district surveyor and the sanitary inspector are armed with statutory powers—once a notice is served the work has to be carried out to their satisfaction and under their supervision. I believe some such officer will have to be available in the electricity departments, but he must be free to inspect the council's own work if it does any.

Surplus power-station men, no doubt a worthy race and deserving of a meed of sympathy in these days of the axe, are not the most suitable; neither is the man who has outgrown his usefulness as an office boy. The installation inspector must be a man of mature judgment and experience armed with powers that will make him something of a "free lance," and able to secure safety and efficiency.—W. G. B.

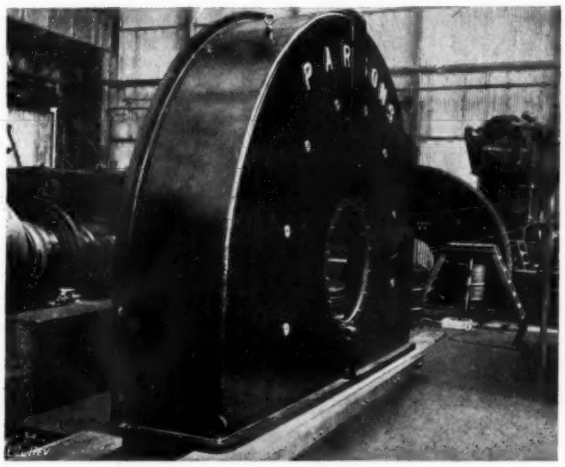
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Non-conducting Alternator End-shields

Cast iron has been employed for alternator end-shields since the earliest days. It possesses three drawbacks: it is an electrical conductor, it is heavy, and it has magnetic qualities. Owing to their conductivity, end-shields of cast iron are the seat of eddy-currents induced by the rotating magnetic field of the machine. To reduce their weight they are made as thin as possible, with the consequence, in many cases, that they are readily set in vibration and thus contribute largely to the noise of the machine.

MESSRS. C. A. PARSONS & Co., have devised a new kind of end-shield, indistinguishable in appearance from the usual type, but entirely non-metallic. Such shields have been fitted to the latest 33-kV machine to be put into service at Brimsdown, and they will also be used for a machine of the same



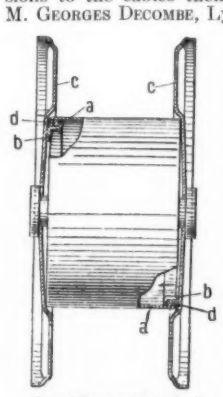
A Parsons non-conducting end-shield

voltage which the company is now building for Cape Town.

The general appearance of one of the non-metallic end-shields is shown in the illustration. The end, it will be noticed, is flat, but rigidity, and, therefore, a complete absence of vibration, is ensured by the attachment of the surface to the ends of the studs which hold the end windings of the stator. The eight bosses for these studs are visible in the picture, and their disposition ensures effective support for the surface. A corresponding attachment is impossible with metallic shields owing to the magnetic short-circuiting which would be produced. The light weight of the new shields is a feature which will be appreciated by the engine-room staff whenever it is required to remove them for inspection purposes.

An Improved Cable Drum

In order to avoid damage to cable drums and on some occasions to the cables themselves owing to the rough handling, M. GEORGES DECOMBE, Lyons, France, has recently patented in that country the improved form of drum shown in the accompanying drawing. As will be seen, the drum proper *a* is held in position between the extended sides by specially shaped steel plates *c* to which a steel gutter-shaped trough *b* is secured, the latter forming a bed for a rubber ring *d*.



A rubber-supported cable drum

Motor Bus Electrical Equipment

Following a long experimental period SIMMS MOTOR UNITS, LTD., Percy Buildings, Gresse Street, W.1, have lately introduced special electrical equipment for motor buses and coaches. At present only one size of dynamo is being made; a 7-in. unit generating at 12 V that is available for low-speed generation for a lamp load of 30 A, or high-speed operation for a load of 42 A. Additionally, a 24-V dynamo can be supplied, being designed to be driven at double the engine speed. The dynamo, switchboard, and control gear are constructed on robust lines. The dynamo, which is plain shunt wound, is of the six-pole type; only four brush sets are, however, employed, there being two lines of brushes. This leaves two segments of the commutator unencumbered and so facilitates inspection. The brush holders are large and are made from aluminium-copper alloy die castings. The equipment is intended to provide current at a constant voltage. The regulator, which is designed for easy adjustment or part replacement, is double-acting, so that at the lower dynamo speeds it operates by throwing a resistance rapidly in and out of the field circuit, whilst at the higher speeds the regulator intermittently short circuits the field winding. The switchbox is so arranged that the wires may be introduced and fitted without any need for the switchbox to be withdrawn.

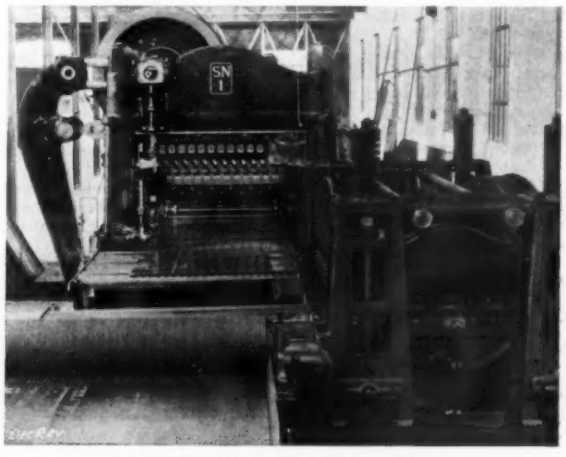
"Osram" Radio Valves

Interesting modifications of the "Osram" series of radio valves, particularly the mains types, both for a.c. and d.c., are being introduced in the new season's designs by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. One of the first to be released is an improved "variable mu" valve. In some receivers a slight increase of sensitivity was considered advantageous, and so the modified "VMS.4" valve, price 19s., has been made with over twice the original mutual conductance. For sets in which such a high sensitivity might cause instability the mutual conductance can be reduced to any desired figure by an increase in the fixed portion of the bias resistance. In all the new season's "Osram" valves the form of anti-microphonic construction due to adequate electrode bonding will be continued, and improvements are being made to details of design with a view to eliminating interference and back-ground noises.

The Humphris Press

The revolutionary ideas embodied in the new Humphris press, made by MASS PRODUCTS, LTD., Thames House, Westminster, S.W.1, were described in our issue of December 11th, 1931, but at that time it was only in the experimental stage. The company has now produced a washer press operating on black mild steel sheets 6 ft. by 3 ft. by 18 s.w.g. The sheet being punched is passed under an oiling roller on to the perforating press, which punches in one operation 72 equally spaced ¼-in. holes along the edge, which are used to guide the sheets through the press. At the same time the ends of the sheet are sheared off to length and half blanks which would result in half washers, are removed. The total lineal cut during this operation is 17 ft. 9 in. under a pressure of 246 tons. As in the press itself the holes are cut by pressure alone and not by a hammer-like blow, thus reducing wear on the dies.

The sheet is then fed into the press, where it comes under the operation of 41 small punches 7/32 in. in diameter, which punch two rows of holes, these being the inside diameter of the small washers. The sheet then feeds forward under 41 punches 7/16 in. diameter, which blank larger holes directly over the small perforations thus forming the small washers. These pass straight through the dies down a chute on to a conveyor. This process can be continued according to the size required and the dies available, the outside diameters of the small washers representing the inside diameter of the larger ones. On the present machine 41 washers of each size are punched at each stroke, and the press works at 80 strokes per minute, giving a total of 6,560 washers per minute—many times more than the ordinary type of press can produce. The sheets of perforated residue, each of which yields 5,864 washers, are both rigid and strong, and have many uses (*i.e.*, for machine guards, concrete reinforcement, metal lathing, &c.), and the market value of the sheet is often as high as the cost of the raw material, enabling the washers to be sold at an



The new Humphris washer press

extremely low price. The press itself is not electrical but the mass-production system of the Humphris press is applicable to the manufacture of the mechanical parts of electrical appliances. These presses are suitable for making almost all parts of switches and "Bakelite" moulding comes within their scope. In the case of electric fires, cookers, hot-plates, kettles, saucepans and similar apparatus, a large proportion consists of metal pressings, which can be easily produced at a low cost by this machine. Other electrical apparatus for the manufacture of which presses can be employed are conduit joints, elbows, switches, lampholders and wall plugs, accumulator cases, voltmeters, ammeters, and the movements and cases of electric clocks.

Parliamentary Notes

(BY OUR SPECIAL REPORTER)

IN the House of Commons last week Mr. Hicks asked the Prime Minister whether he was aware that the Institution of Electrical Engineers had been requested by a Government Department to circulate a document for the enrolment of volunteers to maintain the London electricity supply services in the event of an emergency; and would he state which Department made this request and the reasons for it.

Mr. Baldwin, Lord President of the Council, said that he was aware of the action which had been taken. The document referred to was issued by the Institution by arrangement with the Ministry of Transport as part of the arrangements necessary to keep up to date in certain details the organisation which had been in existence under successive Governments for some ten years for the purpose of carrying on essential services in the event of an emergency of the kind contemplated by the Emergency Powers Act, 1920. Similar action had been taken as a matter of routine on previous occasions.

Mr. Hicks asked if it was not a fact that this Institution had a Royal Charter sanctioned by the House of Commons, giving it specific duties for the promotion of electrical engineering science; and, if that were so, was it not rather a dangerous thing, when once it had been granted a charter for such purposes, to give it permission to engage in work of a political character and in the organisation of labour.

Mr. Baldwin said that he could not answer the first part of that question without notice. He was perfectly certain that it was the duty of the Government to see that, in case of need, London should not go without light.

High Charges in Hampshire

On June 27th Major Mills asked the Minister of Transport if he would cause inquiry to be made into the high cost of electrical energy in the Lymington (Hampshire) area as compared with the cost in neighbouring areas, with a view to its reduction.

Mr. Pybus said that his jurisdiction in this matter would arise only on an application under the Electricity (Supply) Acts for the revision of maximum prices.

Municipal Service Undertakings

On June 27th, in the course of a reply to a question by Mr. T. Williams, the Minister of Health (Sir Hilton Young) said that the total gross outstanding loan debt in connection with municipalities' electricity supply undertakings had risen from £25,638,762 in 1905 to £106,544,442 at March 31st, 1930. In the same period the gross debt on gas undertakings had increased from £23,831,488 to £27,857,779, and that on tramway, light railway and omnibus services from £25,315,339 to £38,462,223.

Central Board Finance

Mr. Pybus informed Mr. Todd on June 27th that the published accounts of the Central Electricity Board showed that the amount of interest paid out of capital up to December 31st, 1931, including interest accrued, was £769,650.

The Progress of the Grid

On June 29th, in reply to a question by Mr. Guy, Mr. Pybus said that the national transmission system of the Central Electricity Board was still in course of construction and it could not yet be said that the Board was controlling the output of electricity under the Act of 1926. The Board was directing the operation of certain generating stations in connection with supplies under temporary or special arrangements, and normal trading in some of the scheme areas would commence during the current year.

On July 4th Mr. Pybus informed Mr. H. Williams that the amount of electricity dealt with by the Central Electricity Board in 1931 under temporary or special arrangements of various kinds was upwards of 900,000,000 kWh.

Electricity Distribution Costs

On July 4th Mr. Hicks asked the Minister of Transport whether he could state what proportion distribution costs bore to the total average cost, including capital charges, of electricity in Great Britain, and the number of electricity supply undertakings disposing of between 1,000,000 and 5,000,000 kWh annually, together with the average capital carried per 1,000 kWh sold; and if he would give similar information to that asked for in the second part of the question in respect of the undertakings selling over 5,000,000 kWh each.

Mr. Pybus said that for the year 1929-30 the position was approximately as follows. The average revenue per kWh sold by all authorised undertakers was 1.38d. and the estimated cost of distribution, including capital charges, was about 0.68d. per kWh sold, or slightly less than 50 per cent. of the average revenue. There were 139 undertakings selling between 1,000,000 and 5,000,000 kWh and 215 selling over 5,000,000 kWh, the average capital expenditures on transmission and distribution per 1,000 kWh sold being £42 and £21 for the respective groups.

Legal

IN the King's Bench Division the hearing was continued during last week of the action by Radiovisor (Foreign and Colonial), Ltd., against Radiovisor Parent, Ltd., to recover £200,000 and the return or cancellation of 100,000 £1 shares, on the ground of alleged misrepresentation. Defendants denied misrepresentation and damage. Continuing the evidence for the defence, Mr. C. L. F. Clutterbuck, cross-examined by Sir Wm. Jowitt, K.C., said that he did not agree with Mr. Avern's statement that if he had seen the Gilbert report on the destructive effect of temperature experiments on the bridge in the laboratory he should not have kept it from Mr. Terrell of the plaintiff company. That report came in the second half of 1928, four months after the first print of the prospectus. He agreed with Mr. Neale, the inventor, that no useful purpose would be served by showing it to non-technical members of the board for the reason that the report concerned laboratory and not ordinary conditions. The statement in the prospectus was substantially true, that the bridge, connected across a 440-V main, had proved constant in resistance for eight months, without deterioration. He could not say that he had found a bridge that had got rid of the disturbing feature of temperature. He had never heard anybody talk about mass production, and it would not be a proper statement.

Mr. V. H. Gilbert, chemist of the Parent Company, gave technical evidence of experiments. He agreed that they knew that the bridge was affected by temperature, rest, strong light, and change of voltage.

Mr. E. E. Gorman, who had conducted some demonstrations, denied that he ever said anything about the constancy and reliability of the bridge, or that it could be manufactured forthwith by mass production.

At his Lordship's rising to attend assizes in the country, the further hearing was adjourned till October.

Radio Company's Scheme Approved

In the Chancery Division on July 1st, Mr. Justice Eve had before him an application by Contal Radio, Ltd., for the sanction of the Court to a scheme of arrangement and there was a petition by certain creditors asking for the compulsory winding up of the company.

Mr. Bowyer said that under the scheme of arrangement the unsecured creditors would be paid 5s. in the £ by instalments. The later instalments would be guaranteed by Mr. Adolph Girsom, the chief shareholder and managing director and a debenture for £500 would be deposited by way of security. The scheme had been approved by the statutory majority of the creditors.

Mr. Turnbull, for the Telsen Electric Co., Ltd., the General Electric Co., Ltd., and the Fuller Accumulator Co. (1926), Ltd., opposed the scheme and urged that his clients should not be deprived of their rights to wind up the company because of the scheme.

His Lordship sanctioned the scheme and dismissed the petition, and directed that the costs should be paid by the company.

Alleged Infringement of Switch Patent

In the Chancery Division, on June 24th, Mr. Justice Bennett commenced the hearing of an action by Busby & Co., Ltd., Birmingham, and Mr. H. D. Twine, Sparkhill, Birmingham, against the Telsen Electric Co., Ltd., Birmingham, claiming an injunction to restrain the defendants from infringing their letters patent No. 345,045 relating to an electric switch of the push-pull type for wireless receivers, and for damages for infringement.

Mr. Shelley, for the plaintiffs, explained that the old type of push-pull switches in wireless receivers were so constructed that jarring or movement which caused vibration led to unpleasant crackling sounds in the loud speaker. Plaintiffs' patent covered an improved switch which eradicated this annoyance. It was alleged that defendants had infringed this patent particularly by selling switches which were resold by a Birmingham wireless dealer in October last year.

Defendants denied the plaintiffs' allegations, and said they had not infringed the patent, and, further, that the patent itself was invalid, as the invention was not novel, by reason of prior publication and prior general knowledge and lack of utility.

Evidence was called in support of the plaintiffs' case, and the hearing was adjourned until June 29th when Mr. Justice Bennett said that for the purpose of determining if what the defendants had done was an infringement of plaintiffs' letters patent, he had to construe the specification relating to the letters patent and determine what it was for which plaintiffs had a monopoly. The question was whether in the switches which the defendants were manufacturing and selling, they were taking and using that for which the plaintiffs claimed a monopoly. The essence of that for which plaintiffs claimed protection was a switch of the push and pull type in which the operating control rod was prevented from turning by a particular means.

As the defendants had not taken what his Lordship regarded as the essential feature of the invention, plaintiffs had failed to prove infringement. It was therefore, unnecessary for him to consider or express any opinion upon the validity or otherwise of the claims which the plaintiffs relied upon, and therefore he dismissed the action with costs.

Sir Hugo Hirst on Current Problems

AFTER dealing with the Company's immediate affairs at last week's annual general meeting of the General Electric Co., Ltd., Sir Hugo Hirst, Bt., the chairman, passed in review a number of matters that are now engaging the attention of the Government and the country's leaders.

Sir Hugo said that he felt happy that this country had at last committed itself to a policy of protection of its industries, but the short time during which we had enjoyed protection had not been long enough to prove results. On the one hand, foreign importers had taken care that our shelves should be full from the day protection became effective. On the other hand, the Government had to act quickly, and the system was not yet based on scientific lines. The electrical industry, in particular had cause for grievance on this account, although it considered itself much better off than before and felt confident that in due course it would get the scientific protection it needed, which was the only one serving the best interests of the country.

[*Elliott and Fry*

Sir Hugo Hirst, Bt., chairman of the General Electric Co., Ltd.

Protection would give many industries which became impotent during a period of free imports and were driven towards extinction an opportunity to rehabilitate themselves. He was satisfied that the policy of breaking away from the gold standard would prove to the ultimate benefit of the producers of this country. It had been said that what we were doing might be useful to us but might be at the expense of others, and that such a policy was not one which would lift the economics of the world out of their slough. He agreed, but was it wrong to look after the welfare of your own family before you looked after that of your neighbours? It was only when we had put our house in order that we could be really helpful to our neighbours.

He hoped that Lausanne would achieve something which would relieve nations from the burdens of war indemnities and reparations which pressed so heavily on them and us. He trusted that the measures which we had taken would balance the Budget, and he particularly hoped that, before the next Budget approached, the Government would submit to the country schemes of economy which would considerably reduce our future commitments in taxation. We could not hope to continue to exist with a permanent Budget of £800,000,000. It was to be hoped that the Ottawa Conference would have some real and lasting influence on the future of the Empire and its trade.

He regretted the presence of so many business people at Ottawa from all parts of the Empire, for while it might be of advantage for them to meet and get to know each other, business people could only settle their affairs after this country and all the Dominions had agreed on some fundamental principles. It might take years after Ottawa for each industry within the Empire to work out solutions best for all the participants in that industry.

He would be satisfied if our representatives could reach a "gentlemen's agreement," the details of which might have to be worked out afterwards by inter-Empire Committees, delegations, or secretariats. The points on which he would like them to agree were: (1) A definite will and decision to come together; (2) An agreement for preference within the Empire; (3) A termination as soon as possible of all the treaties that deprived us of the full benefits of our Crown Colonies; (4) An agreement in principle on complementary production within the Empire; (5) A common sterling currency within the Empire to remove risk of loss of exchange and encourage investment for the development of all parts of the Empire.

The export of this country to the outlying states of the Empire was 50 per cent. greater than the exportation to all other countries, and the further development of that trade was entirely in our hands. Last, but not least, he would like them to come to a unanimous opinion as to the need for the stabilisation of silver. That problem would occupy the world very soon because he knew of no single remedy that was likely to increase the purchasing power of 800,000,000 people in the East, with a corresponding effect on the whole world.

It might be said that the Ottawa agenda expressed too British a policy and was not sufficiently international, but it might be a good thing for a shipwrecked world to see one solid rock arise out of the troubled sea of depression towards which they could swim to safety. It might be our destiny once more to lead the world.

The Royal Agricultural Show

AT this week's Royal Agricultural Show, Southampton, the General Electric Co., Ltd., is exhibiting, just inside the main entrance, a typical line of countershafting, complete with agricultural machines, a portable milking machine, and a log cross-cut saw, all operated by "Witton" electric motors of different sizes. Electric soil-heating cable, which should be of particular interest to market gardeners, is shown laid in a bed to illustrate the method of installation.

For horticulturists there is an example of electric greenhouse heating and intensive lighting for plant culture. A system of lighting for increasing winter egg-production is displayed and attention is drawn to an improved "Magnet" electric egg-testing and candling lamp, while radiant electric hovers which are fitted with an extremely simple and robust temperature control are also on view. Pumps and a portable electric groomer, which is designed for strapping to the back of the operator, are worthy of note, and there is also a display of domestic appliances for many and varied purposes.

One of the most comprehensive displays of electrical applications on the farm is that shown by the British Electrical Development Association in co-operation with leading electrical and agricultural engineering firms. The various uses of electricity for pumping, grinding, chaff cutting, hay elevating, root cleaning, and so on upon the general farm are being demonstrated. In practically every case the exhibits are actually working.

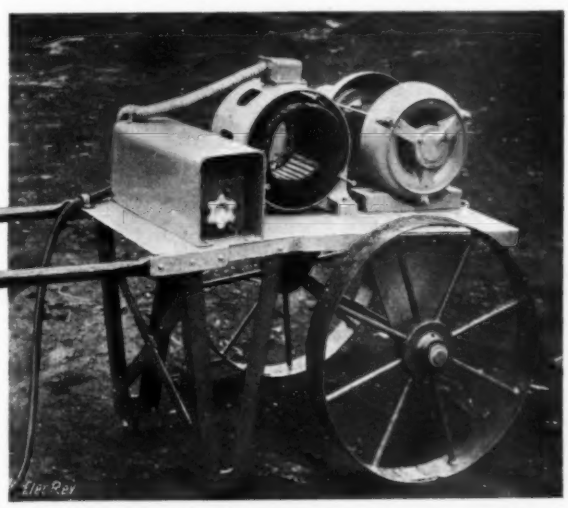
The B.T.-H. exhibits are to be found on the E.D.A. stand and include a full range of electrical machinery applicable to agriculture.

Petters, Ltd., have a range of internal-combustion engines suitable for agricultural, industrial, and marine use. A recently introduced "Universal" air-cooled petrol engine is being shown for the first time.

Messrs. Blackstone & Co., Ltd., are exhibiting machinery for power plants, hay harvesting and cereal grinding, including a small ¾-kW lighting set driven by a petrol engine claimed to be the most compact of its kind ever made. The haymaking machinery includes haymakers, rakes, swathe turners and elevators. Messrs. Ruston & Hornsby, Ltd., also exhibit, showing a range of their engines and pumping plant.

A Farmers' Electrical Conference was arranged by E.D.A. on July 7th, when Mr. F. E. Rowland (G.E.C.) explained "How Electricity Helps the Farmer," with special reference to power and light in and around farm buildings, poultry house lighting, and dairy farming. The advantages of electric driving were summarised and the outputs of various machines per kWh and the cost at twopence per kWh were tabulated.

For lighting, dispersive reflectors of the British standard type were favoured and the standardisation of 60-W pearl lamps recommended, with the following intensities: in cow sheds at milking level 2.75 foot-candles, 1.5 min.; dairy 3.5 ft.-candles, 1.5 min.; food-preparing rooms, 3.5 ft.-candles, 0.5 min.; stables, 3.5 ft.-candles, 1.5 min. The convenience of multi-way switching and the safety of c.t.s. wiring systems were stressed.



The B.T.-H. 5-h.p. squirrel-cage motor mounted on a wheeled truck for farm use

Turning to the dairy, a comparison of hand and machine milking was made, the author remarking that machine milking was extending in this country, while in New Zealand 15,000 milkers were in regular use. Poultry lighting for the stimulation of egg production was being used widely, said the author, who gave graphical and tabular results of experiments which had been carried out at the National Institute of Poultry Husbandry. For brooding a consumption of the order of 1kWh per chick per eight weeks' period was the average. For twenty-one days' incubation the consumption varied from 0.25 kWh per egg for incubators of the order of 100 eggs capacity to 0.03 kWh for 16,000-egg cabinets.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Birkenhead and Wiring Contracts

The Birkenhead Corporation Electricity Committee has recommended that the electric wiring department shall be closed down and that all wiring contracts in future be put out to tender to contractors, also that repair work be dealt with by contractors, except that cases of emergency may be dealt with by the Electricity Department. The Committee has also approved terms of settlement regarding the purchase by the Wallasey Corporation of the Birkenhead Corporation's plant and rights to supply electricity in the areas proposed to be included in Wallasey under the County Council's scheme.

American Instrument Factory for London

Mr. Howard Bristol, president of the Bristol Co. of Waterbury, U.S.A., makers of industrial instruments for indicating, recording, and controlling, has made arrangements for the formation of a British company to manufacture in this country. *The Times* states that the new factory at New Cross has been operating since April, and is already engaged on an important contract as an immediate result of these negotiations. Mr. Howard H. Bristol will be chairman of the new company, and Mr. Lamont Dugon (of J. W. and C. J. Phillips, Limited) the managing director. All the workmen and staff are British.

Irish Free State Electrical Imports

A quiet tone continues to exist in the electrical trade in the Irish Free State, the imports of electrical machinery, fittings, and apparatus during April last amounting to £52,549, bringing up the total for the first four months of the current year to only £198,447, as compared with £234,473, in the corresponding period of last year. The details of the imports are appended :—

	January—April. 1931.	1932.
	£	£
Electric machinery	65,961	65,749
Electric wires and cable	37,579	28,527
Wireless sets and parts	36,755	40,945
Electric lamps and parts	21,217	14,725
Other electrical goods	66,118	45,976
Copper wire	6,843	2,525
Total	£234,473	£198,447

As will be seen, the total shows a decline of £36,026, the imports of radio goods being the only item recording an improvement.

New Municipal Showrooms

Eastbourne Corporation is to erect electricity showrooms in the Market Square at Hailsham.

Warrington Town Council has approved the expenditure of £12,000 on new showrooms and offices for the Gas, Electricity and Tramways Departments.

Electricity in a Carnival

At a carnival recently held at Stourbridge, the Midland Electric Power Corporation for Power Distribution, Ltd., secured first prize for the second year in succession for the most

The Midland Company's tableau

original and attractive display. The accompanying illustration shows the company's tableau which includes a "Revo" cooker, a "Servis" washing machine, and an electric refrigerator.

A Bristol Company's Expansion

A Bristol company—the Central Electrical Engineering Works—has acquired a site of twenty-five acres at Yate in Gloucester, to cope with its rapidly increasing business developments. It is hoped within the next twelve months, when the new site is fully developed, to give employment to 200 extra men. The present business in Bristol will be continued.

Ten Thousand Cookers

To commemorate the hiring out of the 10,000th electric cooker in Manchester, the Lady Mayoress (Mrs. Ellis Green) at the Department's showrooms, St. Ann Street, on June 28th, presented Mrs. Birkhead, of Moston, the hirer of the cooker, with a set of aluminium cooking utensils specially designed for use with an electric cooker. The chairman of the Electricity Committee (Alderman W. Walker) presided, and there were also present Mr. H. C. Lamb, chief engineer and manager, Mrs. H. C. Lamb, president, and Mrs. J. Harcourt-Williams and Miss Foster Jeffery, secretaries of the Manchester and Salford Branch of the Electrical Association for Women. The Manchester electric cooker hire scheme commenced in May, 1923, and at the end of the first year nearly 300 cookers were connected to the mains. At the end of 1928, the 4,000 mark had been passed. Out of a total of 200,000 dwellings in the

Alderman W. Walker presides at the presentation

Manchester area of supply, 48,000 are consumers of electricity, and of these roughly one in every five has an electric cooker. The Department is now connecting new domestic consumers at the rate of 8,000 a year, and the rate of increase is being accelerated by means of the assisted wiring and prepayment wiring schemes.

"Clesco" Publicity

A striking new series of advertisements is shortly to be issued by the County of London Electric Supply Co., Ltd. As the central feature "Miss Millie Amp—the maid of all work" is shown demonstrating how electricity promotes cleanliness, reduces fire risk, and saves time and hard work in the household.

Chinese Electrical Imports

The latest official returns of the imports of electrical and allied goods into China cover the year 1930. These show that the total value of electrical materials and fittings was 17,300,000 taels (value of tael in 1930, 1s. 10½d.), the principal suppliers being Japan (6,150,000 taels), United States (3,600,000 taels), Germany (2,670,000 taels), and Great Britain (2,070,000 taels). The value of imports of telegraph and telephone material, including wireless apparatus, reached a total of 7,100,000 taels, the five principal suppliers being Germany (1,995,000 taels), United States (1,705,000 taels), Belgium (1,462,000 taels), Japan (714,000 taels), and Great Britain (701,000 taels). Machinery imported for electric power stations totalled 3,580,000 taels; the United States supplied about a third of this (1,180,000 taels), the United Kingdom being the next largest with a total of 735,000 taels.

Unloading Grain from Ships

A suction intake plant capable of raising cargoes from holds at the rate of fifty tons an hour, and operated by a 90-h.p. motor, has been installed by Messrs. Hosken, Trevithick, Polkinhorn & Co., Ltd., at their Valletort Flour Mills, Plymouth, in order to speed up the discharge of grain from ships. The electrical work in connection with the installation, which is believed to be the first of its kind in the West, has been carried out by Messrs. Madge & Sons.

Lighting in the New Mersey Tunnel

One of the largest and most difficult pieces of lighting work ever undertaken by the Edison Swan Electric Co., Ltd., has recently been completed at the New Mersey Tunnel. The company's engineers were faced by a number of problems, the principal of which was to avoid glare, and to obtain even and adequate illumination while using lighting fittings which could be sunk flush with the surface of the tunnel. Owing to the varying widths of the iron sections of the lining, the fittings were restricted in width to ensure that they could be fitted into the spaces available. The fittings, each of which

accommodates a 150-W lamp, consist of heavy cast-iron frames with hinged fronts carrying special diffusing glass. They are equipped with white vitreous enamelled cast-iron reflectors of specially designed contour, and each one is provided with its own cast-iron fuse box. They are mounted at about 18 ft. above the road level, trained downwards at an angle of about 45 deg., and are staggered alternately on either side of the tunnel, the total number employed being nearly 1,600; owing to the possibility of damp and corrosive fumes, special precautions had to be taken to render them water-tight. The fittings were manufactured to the designs of Mr. P. J. Robinson, city electrical engineer, Liverpool, and the consulting electrical engineer of the Mersey Tunnel Committee.

Recent Contracts

The Seacombe Ferry improvement scheme for the Wallasey Corporation incorporates the lighting of the new landing stage, passenger bridges, booking hall, offices and vestibules. The new building is approached on the Seacombe side by a carefully planned drive, for the lighting of which "Holophane" refractor units have been specified. A colonnade flanks the front of the building, and also one side up to the main road. This colonnade has a flat glass roof at a height of 14 ft., and is being lighted by "Holophane Refractolite" units. "Holophane" fittings are also being employed in the overhead laylight illumination of the Thornton Heath baths, for which the contractors are Messrs. A. S. Cook, Ltd., West Croydon.

The Metropolitan-Vickers Electrical Co., Ltd., has secured a part contract from the Great Western Railway, for a supply for one year of "Cosmos" electric lamps.

For the third year in succession Messrs. Crompton Parkinson, Ltd., have received an order for the whole of the lamp requirements of the Royal Mail Steam Packet Co.

The General Electric Co., Ltd., has received a contract from the Prestwich Urban District Council for gasfilled lamps for its part requirements for one year.

The Edison Swan Electric Co., Ltd., has secured a contract from the Post Office for twelve months' supply of 162,000 sac elements.

Price Reductions

The "Beeantee" Illuminations, Ltd., announces a reduction in the prices of miniature holders. These holders are made in two models—"A" Miniature B.C. with shade carrier, and "B" Miniature E.S.—and as with standard models, are all fitted with fixing lugs.

B.E.A. Handbook

The British Engineers' Association has just published the 1932 edition of its handbook containing a classified list of members and their manufactures. Within the next few weeks 5,000 copies of this publication will be despatched to selected known buyers of engineering products in the home and overseas market, and copies will also be sent free of charge to anyone interested in the purchase of engineering plant, &c., on application to the secretary.

New Electricity Showrooms at Newmarket

The new showrooms of the Newmarket Electric Light Co., Ltd., were formally inaugurated by Mr. H. Hambling, J.P., a member of the Urban District Council, on June 28th, in the presence of a large gathering which included Sir James Devonshire (chairman of the company) and Capt. J. M. Donaldson. In addition to a general showroom in which a variety of domestic appliances and lighting fittings are displayed, the new showrooms include a demonstration electric kitchen. The building is electrically heated throughout, partly by the panel system and partly by tubular heating. The Newmarket Company is controlled by the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., which is managed by the "Northmet" Company.

Exterior and interior views of the Newmarket showrooms

Social Events

Twenty competitors took part in the annual golf tournament of the Liverpool and District Electro-Harmonic Society at Southport on June 29th for the electrical and allied trades challenge cup. The trophy was won by Mr. P. Tonks (Revo Electric Co., Ltd.), with a net score of 73, and the runners-up were Mr. G. P. Dennis (G. P. Dennis, Ltd.), president of the society, with a net score of 74, Mr. T. Whyte (B.I. Cables), 75; Mr. J. E. Allan (supervising engineer, Marconiphone Co.), 79, and Mr. Dearl Hughes, 77. The prizes for the various competitions included six dozen golf balls, golf umbrellas, &c., which were provided by British Insulated Cables, Ltd., W. T. Henley's Telegraph Works Co., Ltd., the Liverpool Electric Cable Co., Ltd., Mr. O. S. Nichols (Liverpool manager, B.T.-H. Co.), and Mr. J. McKenzie (Birkenhead).

The annual outing of the London depôt staff of the Revo Electric Co., Ltd., took place on July 2nd, when the party, presided over by Mr. Alfred Vaughan, director, journeyed to Brighton. The morning was spent according to individual taste, and after lunch the party proceeded by charabanc to Beachy Head, returning to Brighton, where tea was served, *via* Lewes and the inland route. The company returned to Victoria at 10 p.m.

The eighth annual sports meeting of the Athletic and Social Club of Standard Telephones & Cables, Ltd., will be held on the company's grounds, Aerodrome Road, Colindale, N.W.9, on Saturday, July 9th.

An Advertisement Correction

We regret that by a printer's error in Messrs. J. A. Crabtree & Co.'s advertisement in our last issue (Supplement p. 9) the rating of the fused plug for an electric clock connection was given as 25 amp. This, of course, should have read 2/5 amp.

An Electrical Exhibition at Brighton

An electrical exhibition is to be held at the Dome and Corn Exchange from September 14th to 24th.

Annual Holidays

The offices and works of the Rheostatic Co., Ltd., will be closed from July 29th to August 8th.

The works of Messrs. Bruce Peebles & Co., Ltd., will be closed from July 8th to 18th.

For Sale

Ilford Electric Lighting Department has plant for disposal.

The Swinton and Pendlebury U.D.C. has for sale a quantity of d.c. meters.

The Ormskirk Electric Supply Co., Ltd., invites offers for the purchase of gas-driven generating plant.

A manufacturer's stock of radio goods will be sold by auction on July 14th at Whitcomb Court, Whitcomb Street, W.C.

(See our advertisement pages to-day.)

Trade Announcements

A new wholesale stores depôt has been opened by the General Electric Co., Ltd., at 13, Falcon Square, Inverness. The company has arranged to stock at this depôt a representative range of those of its products which are in most frequent demand, and to provide a trade counter service. The telephone number is Inverness 830, and the telegraphic address is "Electricity Inverness."

In response to a general request from the trade, Messrs. W. T. Henley's Telegraph Works Co., Ltd., have ceased to stock the joint boxes for the "Henley" wiring system with their bonding clamps packed separately. These boxes are now packed complete with the appropriate clamps.

Owing to increasing business Messrs. A. J. Colman & Co., electrical and radio factors, 37-39, The Arcade, Northampton, have taken additional premises at 40, The Arcade.

The head office and works of Switches, Ltd., have been trans-

ferred to Leicester, the address being 193, Uppingham Road ('phone 27285).

The Universal Winding Co. has removed its Bradford office to 187, Swan Arcade, Bradford. (Telephone: Bradford 4172.)

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, Etc.	Price June 22nd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper Sulphate ... ... ,,	£17	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	5½d.	—
a Shellac T.N. ... ... per cwt.	£3 15s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate... ... ... per lb.	3¼d. to 3½d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, Etc		
b Aluminium, Ingots ... ... per ton	£95 to £100	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/1½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£119	£8 inc.
Grade II ... ... ,,	£84	£5 inc.
Grade III ... ... ,,	£48	£2 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	6½d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	—
c ,, Wire, basis ... ... ,,	7½d.	¼d. dec.
c Copper Tubes (solid drawn) ... ... ,,	9½d.	¼d. inc.
g ,, Bars best selected) ... ... per ton	£59	—
g ,, Sheet ... ... ,,	£59	
g ,, Rod ... ... ,,	£59	
g ,, (Electrolytic) Bars ... ... ,,	£36 5s.	—
d ,, ,, Sheets... ... ... ,,	£64	—
d ,, ,, Wire Rods ... ... ,,	£40 5s.	—
d ,, ,, H.C. Wire ... per lb.	5 11/16d.	1/16d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
m German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	3½d.	—
i Iron, Pig (Cleveland No. 3) ... ... per ton	58/6	—
i ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£12 5s.	15s. inc.
g Mercury ... ... per bot.	£11 15s. to £12 5s.	—
e Mica in original cases) small ... per lb.	6d. to 8/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1d.	—
p ,, ,, drawn bars & rods ,,	10½d.	—
p ,, ,, rolled strip & sheet ,,	10½d.	—
p ,, ,, wire ... ... ,,	11½d.	—
o Platinum ... ... per oz.	£9 15s.	—
d Silicium Bronze Wire... ... ... per lb.	7½d.	1/16d. dec
r Steel, magnet, in bars ... ... ,,	7½d.	—
g Tin, Block (English) ... ... per ton	£125 10s. to £127 10s.	£9 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Boiling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd
r W. F. Dennis & Co.

New Catalogues and Lists

David Brown & Sons (Huddersfield), Ltd., Park Works, Lockwood, Huddersfield.—Two new leaflets dealing respectively with helical gears and the charge of frequency.

English Electric Co., Ltd., Stafford.—Publications on steam turbo-generating plants for small outputs (No. M.56A), electrical equipments for rolling mill drives (No. 422-B), and oil immersed control pillars for slip-ring induction motors of the non-reversing type (No. N.52).

Walker Brothers (Electrical Engineers), Ltd., Temple Row, Birmingham.—The summer number of the "Electrical News" containing an article on inexpensive modern lighting.

H. G. Moseley & Co., Ltd., Eddo Works, Hospital Street, Birmingham.—An illustrated list containing details of several new "Eddo" domestic appliances.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, N.7.—A leaflet pointing out some of the features of the company's furnaces.

Curfew Electric Heaters, Curfew Poultry Farm, Gogmore, Chertsey.—A leaflet illustrating and describing two new "Curfew" incubators.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester.—Catalogues 6A1, 7A2, and 90A1 dealing respectively with metal-clad installations with round tank breakers, 132-kV switchgear at the Ribble and Lancaster stations, and control room equipment.

Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham.—A booklet introducing the "Auto-Memota," a new push-button operated starter with fully automatic protection against overload and voltage failure.

Girlings, Ltd., Electricity Works, Maldon, Essex.—Leaflets describing boiling rings and attachments for converting them into grills.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne. — Leaflet No. 850 depicting and describing the company's electric service table.

Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.—The June "Reflector" containing articles on some recent lighting installations at home and overseas.

M. & C. Switchgear, Ltd., Kirkintilloch, Glasgow.—An illustrated pamphlet describing in detail the company's metal-clad oil-break switchgear.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, W.C.2.—The July-August "Link," dealing with electric kitchen equipment, radio, high-frequency apparatus, &c.

Fuller Electrical & Manufacturing Co., Ltd., 5, Chancery Lane, W.C.2.—Pamphlet T.102 containing illustrations and particulars of a number of transformers recently manufactured at the company's Walthamstow works.

Star Electro Carbons, Cleveland Road, E.18.—A booklet giving full particulars and prices of the firm's carbon brushes and a pamphlet advertising "Erycid" commutator dressing.

Belgrave Electric Co., 24, Belgrave Road, S.W.1.—A priced and illustrated mailing card dealing with push-bar and key-switch lampholders.

Alan Wright, Ltd., 117, Victoria Street, S.W.1.—An illustrated brochure pointing out the salient features of the "Condensacone" water heaters.

Crowther, Ltd., 1, Welford Place, Leicester.—A catalogue describing the British-made "Pourtier" wire-covering machines.

British Porcelain Co., Ltd., Artillery House, Artillery Row, S.W.1.—The May issue of the "Vista" containing an article on modern methods of porcelain insulator manufacture.

B. & F. Carter & Co., Ltd., Albion Works, Whitehall Street, Rochdale.—An illustrated catalogue of braiding, plaiting, and electric cable-making machinery. Also leaflet No. 10, describing the "Speedway" cables used on braiding machines.

Electric Art Shades (1928), Ltd., Kelvedon, Essex.—A blotter illustrating the company's new showrooms at 8, Paternoster Row, E.C.4.

Brook Motors, Ltd., Empress Works, Huddersfield.—A folder drawing attention to the low running costs of Brook motors.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A folder dealing with a new range of "contactor break" a.c. control gear.

Donovan & Co., 46 & 47, Great Charles Street, Birmingham.—Publication No. 311,210, dealing with flexible metallic conduit and couplings.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—An 80-page publication (No. 7405/4) on supervisory selective control for generating and converting plant, motors, transformers, circuit-breakers, instrument indicators, &c. New and revised leaflets for insertion in the company's sectionalised catalogues relating to motors, switchgear, control gear, instruments and meters.

Private Arrangements

Baxter & Caunter, Ltd., manufacturing and electrical engineers, 221, Tottenham Court Road, W.—A further meeting of creditors was held on June 23th at Winchester House, E.C., when Mr. G. W. Kettlewell, one of the directors of the company, presided. The chairman said that the shareholders had previously passed a resolution that the company should go into voluntary liquidation, and they had nominated Mr. A. A. Lough, of Messrs. Mann, Judd, Gordon & Co., 8, Fredericks Place, Old Jewry, E.C., as liquidator of the company. According to the statement of affairs as at March 30th last, the date of the appointment of the Receiver for the debenture holders, the liabilities amounted to £13,317, all due to unsecured creditors, and there were also contingent liabilities in respect of bills discounted totalling £1,262, which were not expected to rank. The assets were estimated to produce £15,403, from which had to be deducted preferential claims for £615, and a bank overdraft secured by a debenture for £10,562, leaving net assets of £4,226, or a deficiency of £14,591. Mr. Lough said that the business had been carried on successfully for over thirty years, and in the circumstances it was quite possible that there would be some value in the goodwill. According to a balance sheet as at December 31st, 1928, which was just prior to the debenture being created, there was a surplus of assets over liabilities of £8,400. During the following 3¼ years' trading the company made a net loss of £7,600, before charging anything for bad debts, now shown at £9,500. In addition to that there had been a writing down of furniture, &c., of £1,900, and stock £3,900, which practically accounted for the deficiency now shown. A resolution was passed confirming the appointment of Mr. Lough as liquidator, with a committee of inspection.

A. E. Luen, lately trading as Luens Electrical Supplies, now trading as Mules Electrical Supplies, Co., 2, Dumfries Place, Cardiff.—A further meeting of creditors in this matter was held recently at the offices of Messrs. Poppleton & Appleby, 35, Windsor Place, Cardiff, when an approximate statement of affairs was submitted which disclosed liabilities of £2,115. The net assets were £138 or a deficiency of £1,977. It was resolved that the debtor be given seven days in which to come forward with an offer of 5s. in the £. secured to the satisfaction of the committee of inspection appointed at the previous meeting.

Sillitoe & Allsopp, 5, Paradise Street, West Bromwich, electrical engineers.—A meeting of the creditors was held recently, when a statement of affairs was submitted which disclosed liabilities of £1,305 and a deficiency of £1,000. It was resolved that in the event of the cash creditors withdrawing their claims a deed of assignment should be executed in favour of Mr. F. E. Bendall, of Messrs. Poppleton & Appleby, of Birmingham.

Bankruptcy Proceedings

B. Barnett, electrical engineer, lately carrying on business at 29, North Street, Barking, and 317, Roman Road, Bow, E.—A sitting of the London Bankruptcy Court was held on June 29th before Mr. Registrar Warmington for the public examination of this debtor, who petitioned the Court on February 9th, 1932, and was adjudged bankrupt with total liabilities of £2,666 (ranking £1,616) and assets consisting of valueless shares and a bad book debt for £603. Mr. Walter Boyle, the Senior Official Receiver, said that he had received a communication from creditors to the effect that the debtor was in the habit of appearing at different places and trading under a number of different styles. A previous bankruptcy was recorded against him in December, 1931, when acting as director of B. Barnett (Electrical Engineers), Ltd. The debtor attributed his present failure and insolvency to his liability for debts incurred on behalf of Maurice Engineering Co., Ltd.; to the failure of that company; and to its inability to pay off the debts taken over. The examination was concluded.

J. Brown, radio and gramophone dealer, lately of 334, Goswell Road, E.C.—The first meeting of creditors was held on June 24th at the London Bankruptcy Buildings before Mr. H. Wheeler, Assistant Official Receiver. The receiving order was made on June 10th upon the petition of Celestion, Ltd., creditors for £843, the act of bankruptcy alleged being the departure of the debtor on February 18th last with intent to defeat or delay his creditors. The chairman reported that the debtor had not surrendered to the proceedings and nothing was known regarding his present movements. It appeared that executions had been levied at Goswell Road on behalf of creditors, and there was nothing left on the premises. The case was left with the Official Receiver.

N. G. Crews, 99, Clapham Road, lately 34, Crown Street, both Lowestoft, Suffolk, electrical engineer.—The public examination of this debtor was held on June 27th at the Town Hall, Great Yarmouth, when his statement of affairs showed liabilities of £169 and a deficiency of £139. The examination was closed.

W. Smith (trading as W. Smith & Co.), 12, Haden Road, Old Hill, Staffs, electrical engineer.—This debtor attended at the Court House, Priory Street, Dudley, on June 29th for his public examination. His statement of affairs showed a deficiency of £502, which he attributed to "decline in trade through general depression." It was disclosed that the principal creditors were the bank in respect of an overdraft. The hearing was concluded.

R. O. Woodruff, electrical and radio engineer and contractor, 4, Bridge Parade, Godstone Road, Purley, Surrey.—The first meeting of creditors was held on July 1st at 29, Russell Square, London, W.C., when a statement of affairs was submitted which disclosed ranking liabilities of £692, with net assets of £194, leaving a deficiency of £498. He attributed his position to "medical and other expenses in connection with his wife's illness and his own accident, and to loss of trade as a result thereof, and to keen competition in the trade." The case being a summary one was left in the hands of the Official Receiver as trustee.

A. C. Clewley, electrical goods factor, 21, Portland Street, Walsall, Staffs, lately trading as "Radioland," Walsall, Staffs.—The public examination was held on June 23rd at the Court House, Walsall, when according to the statement of affairs there was a deficiency of £261. Debtor attributed his failure to depression in trade and lack of capital. The examination was adjourned for closing.

P. F. Chipps, electrical engineer, 6, Oak End Way, Gerrards Cross.—Receiving order made June 24th on debtor's own petition.

D. W. Morphy, manufacturer of wireless apparatus, 14, Collinette Road, Putney, S.W.—Second and final dividend of ¾d. in the £, payable any day at Bankruptcy Buildings, Carey Street, W.C.

C. H. Garrett (Hilton Garrett & Co.), dealers in electrical supplies, 128, Queen's Road, Brighton.—First and final dividend of 1s. 6½d. in the £, payable July 5th at the office of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton.

Company Liquidations

The Bond Wholesale Electrical Co., Ltd., 19, Halford Street, Leicester.—The statutory meeting of creditors was held recently, when a statement of affairs showing the position of the company as at May 13th, 1932, was submitted; this disclosed liabilities of £2,024 and a deficiency of £142. The company was registered on May 27th, 1931. According to figures prepared for the period from June 1st, 1931, to May 18th, 1932, the sales had been £4,010, on which a net loss was incurred of £1,010. The directors attributed that heavy loss to selling goods at cost price and to the fluctuation in the price of cable. It was stated that on May 13th last the debenture holder appointed as receiver Mr. P. T. Muggison, who had been nominated by the shareholders at a previous meeting as liquidator. The creditors passed a resolution confirming that appointment, with a committee of inspection consisting of Mr. Horsburgh, representing the Derby Cables, Ltd., and Messrs. A. Cripwell and F. E. Bendall, representing other trade creditors.

Home Electric, Ltd., wireless dealers, 24, Sackville Street, London, W.—The statutory meetings of creditors and of shareholders were held on June 24th at the Board of Trade Offices, Carey Street. The company was registered on July 30th last with a nominal capital of £100, and was promoted by the directors of the Kinson Electrical Co., Ltd., which conducted business at the same address as retailers of wireless goods. The failure was attributed to lack of capital and to heavy charges for financing the hire-purchase business. It seemed to the Official Receiver that the gross profit of the business was never enough to pay overhead charges. No statement of the company's affairs had yet been filed. A resolution was passed appointing Mr. Snelling, 24, Essex Street, Strand, W.C., as liquidator.

Rosedale Salons, Ltd., wireless manufacturers, 25, Finsbury Square, E.C.—The statutory first meetings of the creditors and shareholders were held on June 23rd at the Board of Trade Offices, Carey Street. No statement of affairs had been lodged, but the liabilities were estimated at £3,033 for goods supplied and £500 on the debentures, while the assets were expected to produce £690. The failure of the company was attributed to trade depression, competition by "cut price" shops, small margin of profit, and heavy expenses. The liquidation was left in the hands of the Official Receiver.

Furnace Electric Heating Co., Ltd.—Particulars of claims by July 31st to the liquidator, Mr. C. Peckett, 22a, Commercial Street, Halifax.

F. W. Ames, Ltd.—Particulars of claims by July 22nd to the liquidator, Mr. R. B. Baggaley, Commerce Chambers, Parliament Street, Nottingham.

G. J. Scragg & Co., Ltd.—Meetings August 2nd at District Bank Chambers, 1, Frodsham Street, Chester, to receive an account of the winding-up by the liquidator, Mr. H. Parsonage.

Peterborough Electric Traction Co., Ltd.—Meeting July 29th at 88, Kingsway, W.C., to receive an account of the winding-up of the company by the liquidators, Messrs. W. E. Bennett and J. Worssam.

Electricity Supply

Lighting, Domestic, Power

Ayrshire.—OFFER TO PURCHASE UNDERTAKING.—At a recent meeting of the County Council a letter was read from Messrs. Balfour, Beatty & Co., Ltd., regarding the latter's proposal to purchase the Ayrshire Electricity Board's electricity undertaking. It stated that the company was prepared to purchase the undertaking on the terms of providing for the repayment of all loans and other outstanding obligations of the Board, together with an additional sum to cover reasonable reimbursement of the constituent authorities for the value of services rendered by them in the establishment of the Board and being responsible for the administration of the undertaking during the last seven or eight years. Representatives of the Ayrshire Electricity Board expressed surprise at the letter, and stated that there had been no offer before the Board. The matter is to be discussed further.

Barnstaple.—INDUSTRIAL LIGHTING CHARGES.—The Lighting Committee has decided that the charge of 6d. per kWh for electricity used for lighting in manufacturing works shall be operative only in cases where contracts for power supply have been entered into.

Birkenhead.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to a loan of £4,750 for the provision of plant for a supply of electricity to the new Mersey tunnel.

APPLICATION FOR LOAN.—The Committee is to seek sanction to a loan of £25,000 for further mains and services in the Wirral area.

Blackburn.—SPECIAL ORDER.—The Town Council has approved a resolution to apply for an Order to supply electricity to Balderstone, Mellor, Osbaldeston, Salesbury, and Tockholes.

LOAN.—Application is to be made for sanction to borrow £31,514 for new switchgear necessary in connection with taking over Whitebirk as a "selected station."

Bradford.—LOAN APPLICATION.—The Electricity Committee is to apply for sanction to borrow £200,000 for mains extensions and house services during the next three years, the money being used in instalments as and when required. A steady increase in electricity demand is being maintained.

Bredbury and Romiley.—A Ministry of Health inquiry was held on June 28th relative to the application of the Urban District Council for a loan of £2,200 for the conversion of street lamps from gas to electricity, and the provision of additional electric lamps. There was no opposition.

Continental.—GERMANY.—According to a return issued recently by the German State Statistical Department, the number of electricity undertakings in Germany increased during the past year from 201, with a total capital of £105,050,000, to 204 with a capital of £120,550,000. Of the last-mentioned sum, twenty-four undertakings were responsible for £83,300,000.

LITHUANIA.—Preparatory work in connection with a hydro-electric station on the Niemen river was started last month. The river at the spot chosen is about 200 metres wide, and on the left side an embankment 1,200 metres long will be constructed. The maximum water supply is 4,000 cub. metre sec. (winter), the minimum 150, and the average 330. The output of the station from the three Kaplan 90 r.p.m. turbines with their three-phase alternators will be about 180 million kWh per annum, with an average of 30,000 kW. The basic load is estimated to require 100 million kWh, and the balance will be used for chemical works and seasonal industries. Energy will be transmitted at 100 kV, and transformed at various substations to 30 kV for local transmissions. The more important Lithuanian towns will first be linked up, but it is expected that the smaller towns and villages will be electrified within five to ten years of the completion of the station, which will take about three years.

Crewe.—DISTRIBUTION OF PROFIT.—The Town Council has made an application for sanction to the payment from surplus revenue of the £13,701 excess expenditure on the capital account. With regard to a surplus of £4,485, the electrical engineer is to report on the question of reducing or abolishing meter rents, or increasing the present 2½ per cent. discount allowed for prompt payment of accounts.

Dundee.—PRICE REDUCTION.—According to the Corporation accounts and estimates, the ordinary electric lighting rate is to be reduced by one-eighth of a penny per kWh to 4¼d. per kWh. A total of 43,517,175 kWh was generated during the past year.

Eastbourne.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to Magham Down and Harebeating at a cost of £2,714, and to the Winkney Estate, Hampden Park, at a cost of £11,760, while a £930 scheme for mains extensions is proposed at Hailsham.

Guernsey.—RENEWAL OF CONCESSION.—The question of the renewal of the concession for the supply of electricity in the island is now causing considerable discussion. A recent meeting of Deputies voted in favour of the Island States taking over the existing plant, a similar resolution being subsequently adopted at a meeting of the Guernsey Chamber of Commerce.

Houghton-le-Spring.—The Houghton-le-Spring and District Electric Supply Co., Ltd., has received permission to erect

overhead cables in certain parts of the district for the purpose of supplying electricity to houses under construction.

Ilford.—LOAN APPLIED FOR.—The Town Council has applied for sanction to loans of £18,865 for plant extensions, and £13,550 for mains extensions, &c.

Keighley.—YEAR'S WORKING.—A net profit of £3,421, as compared with £2,556 in the preceding year, was recorded by the Electricity Department for the twelve months ended March 31st last.

Kent.—TARIFF REDUCTIONS.—The West Kent Electric Co., Ltd., has made the following reductions in the charges for Crayford, Chislehurst, Farnborough, Hayes, Keston, Mottingham, North Cray, Orpington, St. Mary Cray, St. Paul's Cray, and West Wickham: Lighting flat rate, from 7d. to 6d. per kWh; two-part tariff from 1½d. per kWh to 1d. under the domestic and business all-in rates.

Lancaster.—BULK SUPPLY AGREEMENT.—The Electricity Committee has made agreement with Messrs. J. Williamson & Son, Ltd., for a bulk supply of electricity. When this supply is in full commission the output of the generating station, which also supplies Morecambe and Heysham, is to be doubled.

Leeds.—YEAR'S WORKING.—The revenue of the Electricity Department last year amounted to £790,302, an increase of £50,274 as compared with 1930-31, while the net profit was £56,534, out of which £48,488 was spent on capital developments.

Leicester.—LIGHTING CHARGE REDUCTIONS.—The Electricity Committee recommends a reduction in the lighting charge for energy consumed over 500 kWh from 5d. to 3½d. per kWh.

Leigh (Lancs).—LOWER TARIFFS.—The Electricity Department made a profit of £6,494 last year and proposes to reduce its lighting flat rate from 4½d. to 4¼d. per kWh, as well as making certain other concessions to consumers.

Maryport (Cumberland).—ELECTRICITY SUPPLY.—The Town Council has received a communication from the Mid-Cumberland Electricity Co., Ltd., stating that it was hoped to begin laying mains in the area in the autumn.

Northern Ireland.—BELFAST.—The Electricity Department last year made a net profit of £52,329, sales of electricity amounting to 70,807,088 kWh, an increase of 1,796,238 kWh on the previous year. The total revenue was £400,474, an increase of £9,695. All classes of supply show an advance with the exception of the shipyards which, owing to continued depression, took 6,841,494 kWh less than last year.

Nottingham.—LOAN.—The Electricity Committee proposes to apply for sanction to a loan of £150,000 for the following purposes:—E.h.p. mains (£10,000), sub-station equipment (£35,000), mains and services (£60,000), meters (£12,000), assisted wiring (£20,000), and apparatus for hire (£13,000). In addition a further sum of £32,695 is to be spent in connection with the laying of e.h.p. mains.

Saddleworth (Yorks).—STREET LIGHTING.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board is to be informed that Saddleworth Council is prepared to light the road to Diggle by electricity next winter if the Board will lay the mains.

Sheffield.—MAINS.—The Electricity Committee has decided to extend mains at a cost of £14,670.

TARIFF RECOMMENDATIONS.—The Electricity Committee recommends the following additional alternative rate for lighting:—Inclusive rate for large business premises: a standing charge of £10 a year per kW of maximum demand, and a running charge of ½d. per kWh consumed for lighting, where the maximum demand is not less than 25 kW and the period of agreement not less than 12 months.

Shipley.—REDUCED CHARGES.—The Urban District Council has revised its charges for electricity, the flat rate for lighting being reduced from 5½d. to 5d. per kWh.

YEAR'S WORKING.—The accounts of the Electricity Department for the past year show a net profit of £4,210.

Special Orders.—Application is being made to the Electricity Commissioners by Mr. Arthur Lloyd Owen for a Special Order authorising him to supply electricity in the urban district of Machynlleth and in part of the rural district of Machynlleth.

The Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them for the transfer of the undertaking authorised by the Irlam Electric Lighting Order, 1915, to the Stretford & District Electricity Board, and to make the Irlam District Council a constituent authority of the Board.

Spilsby.—SUPPLY EXTENSION.—The Mid-Lincs Electric Supply Co. has informed the Rural District Council that there will be a supply of electricity available for villages in the area within 18 months. After the compulsory area is supplied extensions will be made to the non-compulsory areas provided there is sufficient demand.

Surrey.—LIGHTING AND HEATING SCHEME.—The Public Assistance Committee, at the last meeting of the County Council, proposed an expenditure of over £6,300 on improvement of the heating and lighting systems of the Hambledon Institution. The heating system is to be modernised at an estimated cost of £3,800 and the installation of an electric lighting and steam generating plant, including wiring, is estimated to cost £2,530. Messrs. Dalby and Williamson have been appointed as engineers for the scheme, to which the County Council has agreed.

Continental.—SWEDEN.—The new power station of Sillre is now nearing completion on the Indal River in northern Sweden. When fully completed it will receive its power through a double tunnel of a total length of nearly 3,000 metres, which will conduct the water from a small lake situated 197 metres above the power station, the greatest fall in the whole of Sweden. Considerable surplus power will be obtained during holidays, and an unusual departure is being made to conserve the hydraulic energy. During nights and holidays high-pressure pumps will force the water of the river back upwards through the tunnels in the mountain to replenish the water supply of the same lake from which, during work-days, is furnished the power for driving the 12,000-kW plant. This project, when fully completed, will cost over 2½ million kronor (£128,205).

York.—YEAR'S WORKING.—The annual report of the Corporation's electricity undertaking for the year ended March 31st last shows that the total income from all sources was £190,262, an increase of £14,743 over the previous year. The expenditure was £104,681, an increase of £12,312, and the credit balance to meet loan charges is £85,581, compared with £83,150. After meeting interest and sinking fund charges there remains a surplus of £27,226, as compared with £29,404 for the previous year. There was a reduction in generating costs from 0.247d. to 0.221d. per kWh. An increase of 12¼ per cent. is shown in the quantity sold over the 1930-31 period and the total cost (excluding capital charges) was 0.49d. per kWh sold, as compared with 0.51d. in the previous year. The amount sold was 36,093,158 kWh. It is reported that good progress has been made with the rural electrification scheme. The villages yet to be supplied are Green Hammerton, and Kirk Hammerton.

Traction

Australia.—ADELAIDE.—The Municipal Tramways Trust reports a net profit of £10,989 for the half-year ended January 31st—the first profit recorded for several years. The revenue was considerably lower, being £333,957 compared with £378,886 for the corresponding six months last year, but various economies were effected.

Birmingham.—TROLLEY BUSES TO REPLACE TRAMS.—The Corporation Tramway and Omnibus Committee proposes to abandon a portion of the Coventry Road tramway system and to substitute fifty trolley buses. Although on many of the suburban and other routes the petrol-driven omnibuses were very popular the Committee makes it clear that it does not intend to enter into a wholesale abandonment of tramways, but only to deal as occasion arises with routes where it would be unremunerative to reconstruct the track. The scheme will cost £95,000.

Bolton.—THE TRANSPORT QUESTION.—The future of the town's transport system is to be considered by a special sub-committee appointed by the Tramways Committee.

Continental.—BELGIUM.—The Société des Tramways d'Anvers has been carrying out trials for some time past with an electric trolley bus in the Antwerp district. In a report just issued it is stated that the tests have proved so satisfactory that it has been decided to apply to the municipal authorities for permission to replace by trolley vehicles the petrol buses running on one of the dock services.

SWEDEN.—The electrification of the Stockholm-Malmoe-Traelleborg main line and several junction lines uniting this and other lines with the already electrified Stockholm-Gothenburg line is proceeding favourably and is expected to be completed before the end of 1933 as planned. Within the next few days electric traffic will be possible between Katrineholm (on the Stockholm-Gothenburg main line) and Norrkoeping (on the Stockholm-Malmoe line), a distance of 48 km., and between Hallsberg (on the Stockholm-Gothenburg main line) and the town of Oerebro (25 km.). Shortly afterwards the section between Norrkoeping and Stockholm (163 km. of which 47 km. was electrified on the electrification of the Stockholm-Gothenburg line some years ago), will be opened for electric traffic, and by the end of the year another portion of the Stockholm-Malmoe line, between Norrkoeping and Mjoelby, 78 km. in length, will be completed; also the junction lines Hallsberg-Mjoelby (96 km.) and Naessjoe-Falkoeping (113 km.), both connecting the Stockholm-Gothenburg and Stockholm-Malmoe main lines. The remainder, totalling about 400 km., will be completed within the next year.—*Reuter's Trade Service.*

ITALY.—It is announced from Rome that plans are being prepared for the electrification of the railway between Chiasso, on the Italian-Swiss frontier, Milan, and Voghera. The line will connect at Chiasso with the Swiss electrified main line from Basle, and at Voghera with electric railways running to Genoa, Leghorn, and Ventimiglia.

Hull.—YEAR'S WORKING.—The Corporation trams and buses show a deficit of £5,881, the loss on the trams being £4,230. It was estimated that there would be a surplus of nearly £8,000.

Japan.—RAILWAY ELECTRIFICATION.—The Tokyo Bluff Rapid Transit Railway Co. is to start work on the construction of the first section of its proposed railway between Skibuya and Koyenji at a cost of 1,000,000 yen.

Nelson.—BUSES FOR BARROWFORD ROUTE.—The Corporation has decided to substitute buses for trams on the Barrowford route. This service has never been a success, the comparatively short length of tram lines and the heavy overhead charges making high fares imperative.

A new Piccadilly Railway express passing through Stamford Brook Station on its trial run prior to the opening of the Western Extension on July 4th

Newcastle-upon-Tyne.—YEAR'S WORKING.—In a preliminary report of the working of the City Council's transport undertaking for the past year a profit of £15,118 is shown on the tramway service against a loss during the previous year of £2,532. The number of passengers carried, however, was down by four millions, while the actual revenue decreased from £435,000 to £414,000. Economies of £15,500 were effected on operating expenses, while interest and redemption charges declined by nearly £15,000.

Preston.—TRAMWAY ABANDONMENT.—Last Sunday the tram service was discontinued in Fishergate.

South Shields.—TRANSPORT UNDERTAKING'S LOSS.—A deficit of £1,248 is reported on the working of the South Shields transport undertaking, including a deficit of £498 on the trams and £749 on the omnibuses.

TRAMWAY EXTENSION SCHEME.—The question of extending the Town Council's tramway service along Prince Edward Road, which was referred back by the Council at its last meeting, is to be reconsidered by the Tramways Extension Sub-Committee.

Sunderland.—YEAR'S WORKING.—The Corporation tramways annual report for the year ended March 31st shows a revenue amounting to £116,192, which is a decrease of £6,465 on the previous year. The surplus carried to net revenue account was £33,450. During the year £21,006 was spent on reconstruction of tramway track and £14,904 on reconstruction of cars. The balance in the reserve and renewals fund at March 31st was £4,046. Passengers during the year numbered 27,504,022.

FASTER TRAM SERVICE.—The Town Council is to speed up its tramway services and special running schedules are in preparation which will prevent obstruction in certain parts of the town.

Traffic Signals.—Automatic traffic signals are to be erected at the junction of High Holborn and Southampton Row, London.

Communications

Arctic Circle.—RADIO RESEARCH EXPEDITION.—A wireless expedition to the Arctic Circle is being sent under the auspices of the Radio Research Board. Its experiments will consist of measuring the intensity of ionisation in the Arctic Circle. Mr. R. A. Watson Watt, superintendent of the research station at Slough, has already made a preliminary visit to Tromso and Simavik in preparation for the expedition which left England this week to get the apparatus in working order to begin the Polar Year experiments at the beginning of August. The expedition will be taken to Norway under the direction of Professor E. V. Appleton, who will return to England in September after the experiments are in running order, leaving the work in charge of Mr. Geoffrey Builder, of King's College, London. Our picture shows Mr. Builder with the superheterodyne receiver with cathode ray oscillograph and recording camera for photographing echoes reflected from the upper atmosphere which will be employed.

Australia.—BROADCASTING BILL.—There has been a vigorous battle in the Commonwealth Parliament over the details of the Australian Broadcasting Commission Bill. Everyone agreed to the principle of national broadcasting being controlled by a body similar to the British Broadcasting Corporation, but there were pronounced differences of opinion as to the constitution of the Commission and the powers with which it was to be invested. The Bill, as presented to Parliament, shackled the Commission and made it a mere adjunct of the Post Office, the Postmaster-General being given authority over the Commission in every respect, which was to be given power to engage in industries akin to broadcasting (such as the manufacture of wireless receivers). These powers were drastically curtailed as the Bill passed through the House, and the measure as finally adopted practically gives the Commission immunity from Ministerial interference, says *World-Radio*. The Commission comprises a chairman, vice-chairman, and three other members, one of whom is to be a woman. The Government's intention is that the Commission shall function as a board of directors rather than as executive officers. It took over the control of the A class (national) broadcasting stations on July 1st. A general manager is to be appointed.

Great Britain.—RADIO EXCHANGES.—Darlington Town Council has received seven applications; a sub-committee favours the request of Rediffusion, Ltd. A deputation is to be received from the Teesside Wireless Retailers' Association.

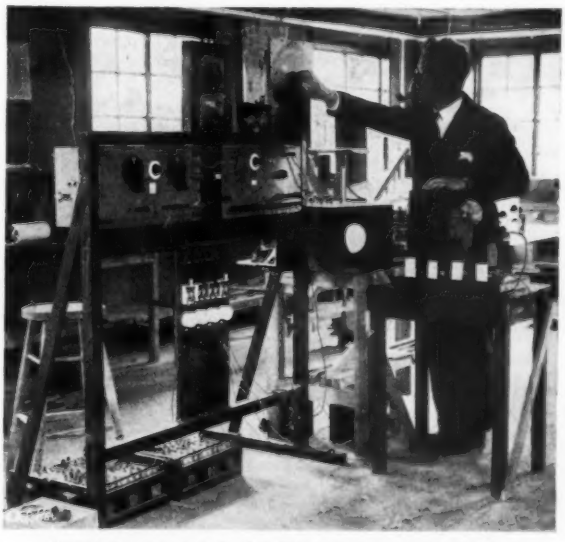
Hull.—TELEPHONE PROFIT.—The municipal telephone service, the only one of its kind in the country, made a profit of £43,770 during the past year, the net profit being £18,760, of which sum £5,000 has been allocated to the relief of the local rates. Royalties paid to the G.P.O. amounted to £11,987, making a total of £187,651 since the commencement of the service. When the Mytongate automatic exchange is completed all subscribers in the city will be served by six automatic exchanges, with the exception of multi-party lines. Extensions to cost £61,000 are to be proceeded with.

India.—CABLES AND WIRELESS MERGER.—As from July 1st, the cable and wireless telegraph services in India have been brought under one control and will now be operated by the new organisation known as the Indian Radio and Cable Communications Co., Ltd. On the opening day of the joint working of the two services, messages were sent by Mr. J. C. Denison-Pender, acting chairman of Imperial and International Communications, Ltd., in London, to the chairman of the board of directors of the Indian company in Bombay, and between Mr. R. M. Chinoy and Mr. Sultan Chinoy, directors of the Indian company, and the Rt. Hon. F. G. Kellaway, joint managing director of Imperial and International Communications, Ltd.

Lithuania.—AUTOMATIC TELEPHONY.—The Lithuanian Government has recently decided to establish automatic telephone exchanges in the towns of Kaunas and Memel.

Rumania.—A VERY LARGE TELEPHONE CABLE.—An important development in cable manufacture is made known by the announcement that subscribers' telephone cable with 2,424 pairs of conductors, accommodated within a single lead sheath, has recently been supplied by Standard Telephones & Cables, Ltd., to the Rumanian Telephone Company. This cable, it is claimed, has the largest number of pairs ever manufactured commercially for a customer in any country. The cable is of the so-called unit type construction, each unit containing 101 pairs of 4-lb. conductors; the inside diameter of the lead sheath is 3¼ in. The cable is designed to carry circuits from a new automatic exchange in Bucharest through one of the principal thoroughfares in the city where duct space is limited.

South Africa.—JOHANNESBURG TELEPHONE DEVELOPMENT.—The Johannesburg Postal Department has started a campaign to increase the number of telephone users under a new scheme



Apparatus for the Arctic Circle research expedition

whereby subscribers pay a low rental and 1½d. per call. The tariff is £3 12s. per annum for a wall set and £3 17s. for a table set, within two miles of an exchange.

Sweden.—TELEPHONE SUBSCRIBERS IN 1931.—The number of subscribers increased during 1931 by 23,999 to 546,453.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—August 23rd. Posts and Telegraph Department. Fuses. (A.X. 11386.)*
July 20th. Victorian Government Railways. A.c. power interlocking machine and power point mechanisms. (A.X. 11388.)*
August 29th. City Council. Five 600-A, 6,600-V, 3-phase, 50-cycle, totally enclosed metal-clad compound-filled switch units. (A.X. 11,399.)*

Belgium.—July 23rd. Commune de Saint Gilles lez-Bruxelles. Supply of 6,000 metres of armoured cable of 10 sq. mm. section for the transmission of d.c. at 750 V. Particulars (Cahier des Charges), for 5 fr. from Service de l'Electricité, 40, Rue Fernand Bernier, St. Gilles, Brussels.

Brighton.—July 14th. Electricity Department. 30,000-kW turbo-alternator, with condensing plant and auxiliaries, and three steam-raising units, combustion equipment, &c. (June 24th.)

Douglas.—Electricity Department. 1,500-kW turbo-alternator and 20,000-lb. water tube boiler. (See this issue.)

Dundee.—July 18th. Harbour Trust. (*a*) Electric capstans and (*b*) 500-kVA transformer, l.p. switchboard extensions and cable work. (See this issue.)

Dumfries.—July 30th. County Council. L.p. overhead lines and services. (July 1st.)

Egypt.—CAIRO.—August 15th. Egyptian Government. Electrification of Assuan Dam (£4,000,000).—*Reuter* (Cairo).

India.—CALCUTTA.—August 1st. Carsac elements for Leclanché cells, and inert dry cells. (A.X. 11400.)*
SIMLA.—August 25th. Indian Stores Department. Lamps. (A.X. 11392.)*

Kelso (Roxburgh).—July 9th. County Council. Electrical work in connection with additions to High School. Mr. G. Sherriff, county clerk, County Offices, Newtown, St. Boswells.

New Zealand.—WELLINGTON.—September 13th. Public Works Department. 1,500-kVA transformer for Mangahao power scheme. (A.X. 11383.)*

Oswestry.—July 23rd. Electricity Department. Erection of an overhead e.h.p. transmission line, switchgear, and transformer. (See this issue.)

Plymouth.—July 12th. Electricity Department. Rotary boiler feed pump. (July 1st.)

St. Neots.—July 15th. Urban District Council. Electrically driven pumping plant. Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.1 (deposit £5).

Seaford.—July 9th. Urban District Council. Automatic electric centrifugal pumps, motors, starting equipment, etc., for sewage scheme. U.D.C. surveyor, Council Offices.

South Africa.—CAPETOWN.—July 27th. Electricity Department. Overhead line material. (A.X. 11387.)*

Stockton-on-Tees.—July 13th. Corporation. Automatic voltage regulator. (July 1st.)

Swansea.—August 3rd. Electricity Department. Generating plant for Tir John North power station. (June 17th.)

West Riding.—July 11th. County Council lighting installation at Hoyland Kirk Balk School. Education officer.

Zetland.—County Council. Electrical works in connection with the Lerwick (Landward) scheme of eighty houses. Schedules from Mr. A. A. Foote, architect, 106, Hanover Street, Edinburgh, not later than July 14th.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birkenhead.—Baths Committee. Accepted. Electric lighting and power installation at new baths (£925).—J. McKenzie.

Bradford.—Electricity Committee. Accepted. Replating main storage battery at Valley Road power station.—Chloride Electrical Storage Co., Ltd.

Cardiff.—Electricity Committee. Accepted. Switchgear (£319).—A. Reyrolle & Co., Ltd.

Dewsbury.—Education Committee. Accepted. Installation of electric clocks and bells at Wheelwright Grammar School (£151).—Ward & Co., Ltd.

Durham.—County Education Committee. Accepted. Installation of electric lighting at the Blaydon secondary school (£340).—Hodgson & Coley. Installation of electric lighting at the Hartlepool Henry Smith secondary school (£259).—L. Robson, Ltd.

Finchley.—Electricity Committee. Recommended. Switchgear, cabling, &c., at control house.—A. Reyrolle & Co., Ltd.

Guildford.—Town Council. Accepted. Installation of automatic signals (£929).—Automatic Electric Co., Ltd.

Hull.—Telephones Committee. Accepted. Cable (£435).—W. T. Henley's Telegraph Works Co., Ltd. Beeswaxed cable (£220).—British Insulated Cables, Ltd. Bronze wire (£244).—T. Bolton & Sons. Switchboards (£230).—Ericsson Telephones, Ltd. Auto table telephones (£380).—Automatic Electric Co., Ltd.

Keighley.—Electricity Committee. Accepted. Supply of transformers for one year.—General Electric Co., Ltd.

London.—L.C.C. Central Public Health Committee. Accepted. Automatic cold storage plants in six hospitals (£2,545).—Pulsometer Engineering Co., Ltd.

Middlesex.—Public Assistance Committee. Recommended. Wireless installation at West Middlesex Hospital (£366).—Phillips Lamps, Ltd. Three refrigerators at Warkworth House (£166).—International Refrigerator Co., Ltd. Internal telephone improvements at Staines poor law institution (£77).—Siemens Bros. & Co., Ltd.
County Council. Accepted. Installation of two bed lifts at Edmonton poor law institution (£669).—Wm. Wadsworth & Co.

Reigate.—Town Council. Accepted. Traffic control signals for the Market Square (£66).—Wardle Engineering Co., Ltd.

Salford.—Transport Committee. Recommended. Material for track reconstruction.—Hadfields, Ltd. (£1,419); Dorman, Long & Co., Ltd. (£4,867).
Electricity Committee. Recommended. One 170-kVA condenser bank (£372).—British Insulated Cables, Ltd.. One 130-kVA condenser bank (£319).—Telegraph Condenser Co., Ltd.

Sheffield.—Tramways Committee. Accepted. Traction lamps, files and cables.—J. Taylor, Dunford & Co., Ltd. Cables.—Mersey Cable Works, Ltd.; St. Helens Cable & Rubber Co., Ltd. Armature coils for Maley and Taunton air brake compressor.—Manchester Armature Repair Co., Ltd. Armature coils and commutators for traction motors.—Metropolitan-Vickers Electrical Co., Ltd.

Southport.—Parks Committee. Recommended. Installation and maintenance of electrical illuminations at Pleasureland for two months (£450).—Wembley Firework Co.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.
We shall be glad to learn the names and addresses of the makers of the following:—
RHODOID.
R.E.A.L. electric fires.
Resistance engraved ADTY—NUERNBERG * OCELIT * CD.

Notes

Ayrshire Electricity Board's Visit

Members of the Ayrshire Electricity Board on June 30th inspected the undertaking in the southern part of the county. At the subsequent dinner in Ayr, Bailie Ritchie Scott, vice-president of the Board, was in the chair, and the company included, apart from the speakers, Mr. E. Bruce Ball, of Messrs. Glenfield & Kennedy, Ltd., Mr. A. E. McColl, engineer, Central Electricity Board (Scotland), and Mr. C. W. Salt, Carlisle. Alderman Tassell (Carlisle), proposing the toast of "The Ayrshire Electricity Board," said that the comprehensive area which the Board had taken in was three times greater than that of Carlisle. The chairman, in his reply, said that within seven years they had grown from a municipal enterprise to an undertaking which covered what he believed to be the best electrically developed county not only in Scotland but in the whole of the British Isles. The majority of the villages in the northern and central areas had a supply. In April last, after long negotiations, they had been able to link up the burgh of Girvan. Since the Board was constituted in 1925 the capital expenditure had risen from £1,237,537 to over £1,985,000; and the number of consumers from 8,789 to 21,329.
Mr. W. C. Bexon (general manager) said he had been looking after the electricity undertaking for Kilmarnock Corporation and the Ayrshire Board for twenty-one years. The industries of the county depended on cheap power, but the Board could not go on with underground distribution and at the same time give cheap power to the big industries.

The I.E.E. Overseas

The Institution of Electrical Engineers has prepared a pamphlet for the information of overseas members with a view to keeping them in closer touch with the central organisation. Some of the information given has the purpose of enabling members coming from abroad to make full use of the resources of the Institution. If such members will inform the secretary of their addresses in this country he will advise them as to various meetings arranged during their stay, or obtain permission for visits to works, &c. Local committees are being, or will be, set up in India and in the Dominions, and it is hoped to establish local centres on the lines of those in working in Argentina and Shanghai. The local committees will be invited to nominate representatives resident in Great Britain to serve on the standing Overseas Activities Committee. The recent "overseas" conversazione which proved so successful is to be an annual event.

The I.E.E. Conversazione

The annual conversazione of the Institution of Electrical Engineers was held as usual at the Natural History Museum, South Kensington, on June 30th. Mr. J. M. Donaldson, president, and his god-daughter, Miss M. I. Feist, supported by members of Council, received the members and guests, who numbered 1,850. Light refreshments were served during the evening and the string band of the Royal Engineers provided a programme of music, in addition to a vocal and instrumental concert.

Some members who played golf at Moor Park that day got rather wet during the morning round, though conditions improved during the afternoon. The 36-hole competition was won by Mr. J. G. Griffin with net scores of 78 and 71, Mr. P. V. Hunter being second with 78 and 76; as players were eligible for only one prize, the prizes for the best scores for the two courses (18 holes) were taken by Mr. W. A. Ritchie with a net score of 78 for the high course and by Mr. S. B. Rogers with the same score for the west course. The prizes for the bogey rounds were taken by Mr. H. S. Taylor, 2 down, on the high course, and by Mr. C. H. Cox, 1 down, on the west course.

The prizes were presented during the evening by Mr. Donaldson at the conversazione. Mr. Griffin received Sir Hugo Hirst's silver cream jug, dated 1762; Mr. Ritchie took Col. Morcom's silver cup; and Mr. Rogers was awarded Mr. Cox's rose bowl. The other three prizes were silver cigarette cases, purchased with part of the money provided for that purpose by Sir T. O. Callender, Sir Alexander Rogers, Mr. M. Railing, Mr. C. H. Merz, and Mrs. P. Rosling. As a result of the competition the benevolent fund receives £30.

A.S.E.E. Awards

In 1931 Mr. S. B. Donkin, president of the Association during the three years 1928-1931, inaugurated a competition by offering prizes for members and associates who made the best verbal communications at the meetings of the Association in discussing the subject of the lecturer. The first prize has a value of £5, the second of £3, and the 3rd of £2; these were awarded as follows:—

1st, Mr. R. W. Whitley, 2nd Mr. W. R. Durtnall, and 3rd Mr. L. W. Medcalf.

The examiners for 1931-32 were: Messrs. G. Scott Ram, W. Lang, J. A. Cowan, B. C. Garman and A. Brammer. The examiners were deprived of the services of Mr. J. A. Cowan during the latter part of the session owing to his illness and death.

Conserving Electrical Energy in Steelworks

In the course of a paper read before the Economic Society of South Africa, Mr. H. J. van der Bijl, chairman of the South African Iron and Steel Corporation, said that the most interesting and important part of the new steelworks now being erected at Pretoria was the means that had been adopted for conserving heat and energy. As the works would be completely electrified, the conservation of electrical energy was also important. Electricity would be purchased from the municipality of Pretoria and surplus heat energy would be used for generating the peaks of electricity demand in order to reduce electricity costs. The scheme consisted in using the surplus heat energy of the steelworks for increasing the load factor of the electricity to be supplied from the Pretoria municipal power station. So far as they could judge the saving from the application of this scheme was not likely to be less than £30,000 per annum.

Street Lighting

By inviting Mr. S. B. Langlands, Glasgow Corporation Inspector of Lighting, to prepare a paper for its annual meeting, the Institution of Municipal and County Engineers demonstrated its recognition of the need for co-operation among municipal officials on this important subject. The title of the paper, "Street Surfaces and Public Lighting," is indicative of its contents. The author has been compelled to study the effect of road surfaces upon visibility at night because financial limits restrict the provision of sufficient light to enable people to see quite independently of its reflection back from street surfaces, buildings, and the objects to be made visible. But dissatisfaction is also felt in cities where really lavish lighting is allowed, and the cause is traced to background. It is a complex problem; often the area complained of has more illumination than its satisfactory neighbour. Observations made and information collected in Glasgow are commented upon, the point being made that the provision of a suitable surface to distribute and reflect light is more than half the battle of the purveyor of public lighting.

Appointments Vacant

Electrical engineer and manager to Heston and Isleworth U.D.C.

Lady demonstrator for Long Eaton Electricity Department.

Mains assistant for Bedford Corporation.

(See our advertisement pages to-day.)

Museum Lighting

That the advent of cheap electricity has entirely altered the problem of the museum curator and architect was stressed at the Museums' Association conference at Birmingham last week, when Dr. J. L. Spencer described artificial lighting experiments of museum cases in the Mineral Gallery of the Natural History Museum, South Kensington. He stated that electric strip-lamps with metal reflectors were used for illuminating large specimens of crystallised spar. They were placed inside the glass of the case, reflections being avoided, while a dark grey painted background was found best to harmonise with the shadows cast by the large specimens. Enlarged photographs were also shown as transparencies, the illumination being supplied from behind by four hanging clear electric lamps. Behind the lights was a reflecting background painted with a zinc-white matt surface. A table case containing a valuable collection of faceted gem stones, which had formerly been illuminated by a 100-W electric bulb lamp suspended five feet above, was now lighted by two 30-W strip-lamps fixed immediately on the top of the case at the back.

Electrical Association for Women

The Mid-Gloucestershire branch of the Association recently held a garden fête at The Grange, Newnham, the home of Mr. H. S. Ellis, general manager and chief engineer of the West Gloucestershire Power Co. Mrs. Pearce-Ellis, the president of the branch, explained that the object of the function was to raise funds for the rent of the new club-room. The fête was opened by Miss C. Haslett, C.B.E., director of the E.A.W., and among the company were Mr. and Mrs. Wallace Harris and Mr. and Mrs. S. J. Gillett, Gloucester; Mr. and Mrs. Coe, Hereford; Mr. and Mrs. S. Billington; Mr. F. H. Corson, Gloucester City Electrical Engineer, and Mrs. Corson; Mrs. L. O. Roberts, social secretary; and Miss G. Johnson, hon. general secretary.

An illustration on page 66 shows Master Arthur Ellis presenting a bouquet to Miss Haslett. With her are Mrs. H. S. Ellis and Mrs. Pearce-Ellis.

The E.D.A. display at the Royal Agricultural Show, Southampton. **(See page 57)**

The Rothamsted Experimental Farm

On June 21st the Minister of Agriculture, Sir John Gilmour, opened the new buildings at Rothamsted Experimental Farm, which, as is well known, is the most important agricultural research and experimental station in the British Empire. It was recently decided to equip the farm buildings with electrical appliances so as to bring them up to date and to provide better facilities for investigating the possibilities of using electricity for various farming operations. The electrical installation, which is being carried out by the North Metropolitan Electric Supply Co., using G.E.C. material and electrical appliances, is not yet completed, but the opportunity of Sir John's presence was taken to inaugurate the new development.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. E. F. Hollands, engineer and general manager of the Hutt Valley Power Board

Mr. E. F. Hollands, M.I.E.E., whose portrait we reproduce, is the engineer and general manager of the Hutt Valley Electric Power Board, New Zealand. In his report covering the year 1931-32, which we have just received, some indication of the rapid growth of the district, and the consequent increase in the demand for electricity, is given. The board operates in the Hutt Valley and the outskirts of the city of Wellington from coast to coast, and covers an area of 700 sq. miles. In addition to supplying a large industrial area, there is a considerable residential demand. In 1925/26 the population of the area covered by the board was 27,275, and the sales of electricity were 3,681,720 kWh with a revenue of £24,413. For the year covered by the present report, the population had risen to 41,500, the sales of electricity to 20,340,670 kWh, and the revenue to £101,565.

Mr. C. H. Merz, of Newcastle, received the honorary degree of D.Sc. at a recent convocation at Armstrong College, Newcastle. The presentation was made by Professor W. M. Thornton, who said that foremost amongst those who were pioneers in the new era of the three-phase electrical transmission in this country, which began in Newcastle and in many ways set an example to the world, the name of Charles Merz was known to every electrical engineer. He paid tribute to Mr. Merz's work in assisting to design and carry out the electrification of parts of the North-Eastern Railway.

At the garden fête of the Mid-Gloucestershire branch of the E.A.W. **(See page 65)**

A resolution of the Plymouth Corporation Electricity Committee in favour of increasing the salary of the borough electrical engineer, **Mr. E. G. Okell,** from £900 to £1,000 per annum, less seven and a half per cent. deduction, has been disapproved by the Establishment Committee. The Committee has also disapproved a recommendation to place the deputy electrical engineer, **Mr. Robert Illingworth,** on the E.P.E.A. scale at the rate of £697 per annum.

Mr. S. E. Evans, A.M.I.N.A., has left Messrs. Swan, Hunter and Wigham Richardson, Ltd., to join Murex Welding Processes, Ltd., as naval architect and expert on welding matters in relation to shipbuilding.

Mr. M. M. Graham, formerly with Asea Electric, Ltd., has now joined Laurence, Scott & Electromotors, Ltd., at the company's London office, 420, Australia House, Strand, W.C.

Mr. W. Blair Smith, electrical engineer and manager of the Paisley electricity undertaking has intimated his desire to resign to the Corporation Electricity Committee. Mr. Blair Smith has not recently enjoyed the best of health, and it is for this reason that he is relinquishing his position. He was appointed manager at Paisley in 1918, after having been assistant manager at Greenock.

Mr. T. M. Kirkby has been appointed London sales manager for the Macintosh Cable Co., Ltd., at Bank Buildings, 20, Kingsway, W.C.2. Prior to this appointment, Mr. Kirby, for five and a half years, had been at Derby with the same company as depôts manager.

Mr. E. T. Oates, M.I.E.E., assistant mechanical engineer in the Johannesburg Municipal Electricity Department, is proceeding overseas on long leave of absence. He is to visit a number of the larger tramways undertakings with the object of obtaining the latest information as to improvements in tramcar rolling stock. Before leaving Johannesburg he was presented by his colleagues with a case of pipes.

Mr. J. Almond, A.M.I.E.E., test laboratory superintendent of the Lancashire Electric Power Co., has resigned his position to take up an appointment as meter superintendent with the Central Electricity Board, N.W. England District. He was presented with a handsome oak buffet by his late colleagues as a token of esteem and affection.

Mr. E. I. Mavor, secretary of Messrs. Mavor and Coulson, Ltd., has been appointed to the board of directors.

The Council of the Institution of Electrical Engineers has awarded the following premiums for students' papers for the session 1931-32: Students' premium (value £10): Messrs. P. McKenna; H. H. Taylour; C. T. Webster and H. T. Price. Students' premiums (value £5): Messrs. W. R. Bishop; J. R. Kennedy; C. F. Lawrence; H. Lillie; W. D. Oliphant; F. Roberts; A. G. Shreeve; R. L. Spiller; and C. S. Whiteley. The Council has awarded a prize, value £5, to Mr. T. A. Long (Stafford), for the paper on "The Relations between Economics and Engineering" submitted by him in competition for the Students' Prize for session 1931-32.

Mr. H. S. Ingleby has disposed of his radio business at Albion Street, Leeds, to his former manager, Mr. R. Elliff, and has joined the staff of Messrs. Scattergood & Johnson, Ltd., at the company's new premises in Leeds.

Mr. R. C. Moore has been appointed by the Transport Committee of the Hull Corporation as traffic superintendent and chief assistant to the general manager, at a salary of £500 per annum.

Sir Bernard E. Greenwell, Bt., has been elected a director and appointed chairman of the Shropshire, Worcestershire and Staffordshire Electric Power Co., to fill the vacancy caused by the death of Mr. F. M. Rogers. **Messrs. A. W. Bolden** and **A. G. Hunt** have also been elected as additional directors.

Mr. Francis N. Cowlin has retired from the board of the Bristol Tramways and Carriage Co., Ltd., and to fill the vacancy **Mr. Walter J. Iden** has been appointed a director. Mr. Iden is a director of the Western National Omnibus Co., Ltd., and of other omnibus companies controlled by the National Omnibus and Transport Co., Ltd., of which company he is managing director.

Mr. E. R. Johnson, Divisional Controller of Posts and Telegraphs of the Orange Free State Province, South Africa, has arrived in this country on a holiday, accompanied by Mrs. Johnson.

The Electric Supply Department (Sutton, Carshalton, &c.) of the South Metropolitan Electric Tramways & Lighting Co., Ltd., has been sold to the London & Home Counties Joint Electricity Authority, and the Department was transferred on July 1st. Mr. A. V. Mason, the engineer, remains with the tramway group of the Metropolitan Electric, London United, and the South Metropolitan Electric Tramways, Ltd., as engineer and deputy to Mr. Spencer, the general manager. The whole of the local "Southmet" staff, with Mr. Denman, the resident manager, has been transferred to the Joint Authority.

Obituary

Mr. E. R. Carter.—As we briefly reported in our last issue, Mr. Edwin Righton Carter died on June 25th at his home, 48, Christchurch Avenue, Brondesbury, N.W.6, after a very short illness. He was 69 years of age. Mr. Carter completed his apprenticeship at the Great Northern Railway Works, Peterborough, and later served afloat as a marine engineer. He eventually joined the London staff of Messrs. W. T. Glover and Co., Ltd., and served as their representative for thirty-four years. The cremation ceremony took place at Golders Green on June 29th.

The late Mr. E. R. Carter

Mr. T. Jacob.—The death is announced at the age of 54 years of Mr. Thomas Jacob, director of Jacob, White & Co., Ltd., electrical and mechanical engineers, Islington, N.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Buchanan & Curwen, Ltd.—Private company. Registered July 4th. Capital, £15,000 in 11,000 6 per cent. cumulative preference and 4,000 ordinary shares of £1 each. Objects: To acquire the business of electrical engineers and contractors heretofore carried on by H. Buchanan and C. Curwen, at 68, Victoria Street, London; 36, Baldwin Street, Bristol, and North Street and Fairfield Works, Leatherhead. The directors are: H. Buchanan, 1, Radnor Road, Westbury-on-Trym, Bristol, and C. Curwen, 62, Albemarle Road, Beckenham (both permanent governing directors, subject to each holding 1,000 ordinary shares). Solicitors: A. W. Taylor, Son & Corpe, Bristol.

Alklum Storage Batteries, Ltd.—Private company. Registered July 1st. Capital, £7,000 in £1 shares. Objects: To carry on the business of manufacturers of all classes of secondary and primary batteries, electric motors and dynamos, switches, switchgear, bells, lamps, clocks, signs, cookers, heaters, household lighting plant, fittings, wireless receiving plant, &c. The first directors are: G. Normanton, "Rockhurst," Savile Park, Halifax, wool merchant; J. Robinson, "Longfield," Burnley Road, Sowerby Bridge, worsted spinner; W. Emmott, 8, Eversley Mount, Halifax, consulting engineer. Registered office: Waterside, Halifax.

Distavox, Ltd.—Private company. Registered June 29th. Capital £1,000 in £1 shares. Objects: To carry on the business of radio engineers, manufacturers of and dealers in electric accumulators and batteries, wireless aerials, cabinets and accessories, gramophones, &c. The first directors are:—G. W. E. Doughty, 4, Blue Hall Mansions, King Street, W.6; C. G. Ireland, 210, Acre Road, Kingston-on-Thames; and F. H. J. Knight, 127, Dyers Hall Road, Leytonstone, E.11.

Electrical & Mechanical Manufacturing Co., Ltd.—Private company. Registered in Dublin on June 28th. Capital £3,000 in £1 shares. Objects: To construct, repair, maintain and run installations, wires, cables, &c. The directors are:—Edward Deckers, 67, Fitzwilliam Lane, Dublin; and J. J. Murtagh, 44, Townsend Street, Dublin. Secretary: D. M. O'Moore.

McCarthy, Mackinlay, Ltd.—Private company. Registered June 30th. Capital £500 in £1 shares. Objects: To acquire the business of wireless manufacturers now carried on by J. McCarthy and W. M. Mackinlay at 39, Charles Street, Hatton Garden, E.C. The subscribers are:—J. McCarthy, 25, St. Albans Buildings, Gray's Inn Road, E.C.1; and W. M. Mackinlay, Elm Bank, Arkley Barnet. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, W.C.2.

Frank Taylor (Electrical Services), Ltd.—Private company. Registered June 28th. Capital £500 in £1 shares. Objects: To carry on business as manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, conductors, transformers, &c. The first directors are:—F. Taylor, 62, Bolingbroke Street, Bradford; and G. R. Dracup, Kirklands, Straightacres Lane, Eccleshill, Bradford. Solicitors: A. V. Hammond & Co., 17-21, Bridge Street, Bradford.

D. C. Tibbles & Co., Ltd.—Private company. Registered June 28th. Capital £700 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless receiving sets and accessories, and all electrical and mechanical appliances, &c. The first directors are:—D. C. Tibbles, 37, Queensbury Road, N.W.9, electrical engineer; and Lucy G. Goodman, 59, Goodhall Street, N.W.10, electrical engineer.

Crewe & Suburban Electrical Services, Ltd.—Private company. Registered June 10th. Capital £100 in £1 shares. Objects: To acquire the business of an electrical and radio engineer and dealer now carried on by A. Davies at 107, High Street, Haslington, near Crewe, and at 142, Flag Lane, Crewe, as "The Crewe and Suburban Electrical Services." The permanent directors are:—R. B. Cropper, Lake House, Sutton, Macclesfield; A. Davies, 142, Flag Lane, Crewe; and H. D. Chatton, 107, High Street, Haslington, near Crewe. Secretary: J. A. Cropper. Registered office: 107, High Street, Haslington, near Crewe.

A. G. Bird & Co., Ltd.—Private company. Registered June 13th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless transmitting and receiving sets, gramophones, electrical apparatus, &c. The life directors are:—A. G. Bird, 39, Montrose Avenue, N.W.6; and Elsa Van Reeh, 5, St. Dunstan's Gardens, W.3. Registered office: 39, Montrose Avenue, Brondesbury, N.W.6.

Electric Clocks, Ltd.—Private company. Registered June 14th. Capital £100 in £1 shares. Objects: To manufacture electric clocks or other electrical and mechanical contrivances, wireless apparatus, radio gramophones, &c. The permanent directors are:—J. Toby, Royal Automobile Club, Pall Mall, S.W.1; and S. E. Wise, 25, Playfield Crescent, East Dulwich, S.E. Secretary: C. E. Wise, 43, Davidson Road, Croydon.

St. James's Electrical Co., Ltd.—Private company. Registered June 20th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of electrical and gas fittings and accessories, and lighting and heating goods, &c. The subscribers are: A. B. Wearing, 32, Victoria Street, S.W.1, and V. W. Taylor, 19, Rosemary Avenue, Hounslow West.

Acorn Electrical Co., Ltd.—Private company. Registered June 22nd. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and other signs, dynamos, motors, armatures, magnetos, conductors, cookers, insulating materials and all kinds of electrical plant and supplies, except batteries and accumulators. The subscribers are: A. F. C. Davies, 67, Perryn Road, W.3, and H. C. Davies, 202, High Street, Kingston. Secretary: E. Ward. Registered office: Acorn Works, The Steyne, Acton, W.3.

Mains Power Radio, Ltd.—Private company. Registered June 22. Capital £100 in £1 shares. Objects: To carry on the business of electrical, wireless, mechanical and general engineers, engineering contractors, &c. The subscribers are: K. C. Radley, 11, Courtland Avenue, Norbury, S.W.16, and H. Owen, 21, Stanmore Street, Barnsbury, N.1. Secretary: H. Owen. Registered office: 5, John Street, Bedford Row, W.C.1.

Acme Radio Repairs, Ltd.—Private company. Registered June 22nd. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in wireless, telegraphy, television and telephone apparatus and supplies, electrical and automobile apparatus, &c. The subscribers are: I. F. Anderson, Woodgrange, Henbury Road, Westbury-on-Trym, and C. W. Shillan, 36, Bayswater Avenue, Redland, Bristol.

Caithness Craven & Co., Ltd.—Private company. Registered June 25th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in wireless receiving and transmitting sets, &c. The directors are: Belle Morton, 62, Michelham Gardens, Twickenham, Middlesex, and C. L. Mountenay, Thames Cottage, High Street, Thames Ditton, Surrey. Registered office: 13, Greek Road, Molesey.

Returns of Electrical Companies

Vortexion, Ltd.—W. T. Flower, 19, St. George's Road, Wimbledon, was appointed receiver and manager on June 21st under powers contained in debenture dated March 10th, 1931.

Herbert Ward, Ltd. (formerly Electro-Coil Production Co., Ltd.).—S. Cole, 18, Essex Street, W.C.2, was appointed receiver on June 11th under powers contained in debenture dated May 31st, 1927. C. I. S. Chappell, Allandale, Knole Road, Bournemouth, has given notice that he has not accepted the appointment or acted as receiver of this company.

Bullers, Ltd.—Capital £400,000 in 20,000 preference and 20,000 ordinary shares of £10 each. Return dated January 13th (filed February 12th), 1932. 15,000 preference and 15,593 ordinary shares taken up. £150,070 paid on 15,000 preference and seven ordinary shares. £155,860 considered as paid on 15,586 ordinary shares. Mortgages and charges, £181,000.

Examples of the attractive and efficient system of "Holophane" lighting employed at the new Sydney Harbour Bridge railway stations. At the Town Hall station platform (left) industrial reflectors are used, while ceiling fittings with prismatic glass illuminate the Wynyard station escalator hall (right)

Samdon Wireless Co., Ltd.—Capital £100 in £1 shares. Return dated August 15th, 1931 (filed April 14th, 1932). Two shares taken up. £2 paid. Mortgages and charges, £350.

C. C. Fires, Ltd.—Capital £5,000 in 4,425 preference shares of £1 and 11,500 ordinary shares of 1s. each. Return dated December 31st, 1931 (filed February 22nd, 1932). All shares taken up. £4,650 paid on 4,425 preference and 4,500 ordinary shares. £350 considered as paid on 7,000 ordinary shares. Mortgages and charges, nil.

Liverpool Electric Cable Co., Ltd.—Capital £300,000 in £1 shares. Return dated May 13th, 1932. 150,000 shares taken up. £127,833 paid. £22,167 considered as paid. Mortgages and charges, £23,616 13s.

Etherwave, Ltd.—Capital £1,000 in £1 shares. Return dated December 28th, 1931 (filed May 3rd, 1932). All shares taken up. £1,000 paid. Mortgages and charges, £800.

Pearsons Electricals, Ltd.—Capital £100 in £1 shares. Return dated December 31st, 1931 (filed March 21st, 1932). All shares taken up. £100 paid. Mortgages and charges, nil.

Vernon Electrical Co., Ltd.—Particulars filed of debentures for not more than £600 authorised June 15th, 1932. charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £600.

Welsh Radio and Electrical Supplies, Ltd.—Debenture dated June 17th to secure £120, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: G. C. Jeremiah, Redlands, Queen's Road, Sketty, Swansea.

Visco Engineering Co., Ltd.—Charge on land in Beddington and Croydon, dated June 10th, to secure £9,000. Holders: Town Investments, Ltd.

Mardy Electric Light Co., Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £2,000.

Waldron Electrical Manufacturers, Ltd.—Further charge on the company's undertaking and property, present and future, including uncalled capital, dated June 17th, 1932, to secure £80. Holder: G. C. Jeremiah Redlands, Queen's Road, Sketty, Swansea.

Detex (1931), Ltd.—Particulars filed of £1,000 debentures authorised June 8th, 1932. charged on company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

Direct Electric Lamp Co., Ltd.—The nominal capital has been increased by the addition of £500 in £1 shares beyond the registered capital of £500.

J. H. Holmes & Co., Ltd.—Capital, £100,000 in £1 shares. Return dated March 16th, 1932. 50,000 shares taken up. £50,000 paid. Mortgages and charges, nil.

Hornby Electrical Supplies Co., Ltd.—Capital, £20,000 in 15,000 preferred ordinary shares of £1 and 100,000 deferred shares of 1s. each. Return dated April 12th, 1932. 1,100 preference and 26,000 deferred shares taken up. £2,400 paid. Mortgages and charges, nil.

Sadia, Ltd.—Capital, £2,000 in £1 shares. Return dated March 21st, 1932. All shares taken up. £2,000 paid. Mortgages and charges: £2,000.

C. P. Rebton, Ltd.—Capital, £500 in £1 shares. Return dated November 23rd, 1931 (filed February 10th, 1932). All shares taken up. £500 paid. Mortgages and charges, nil.

Callington & District Electric Supply Co., Ltd.—Capital, £8,000 in £1 shares. Return dated May 2nd, 1932. 7,430 shares taken up. £7,430 paid. Mortgages and charges, nil.

Electric Lamp Service Co., Ltd.—Capital, £2,000 in £1 shares. Return dated January 14th (filed April 20th), 1932. 607 shares taken up. £607 paid. Mortgages and charges, nil.

Smith & Sturt, Ltd.—H. Brown, 25, Bennetts Hill, Birmingham, ceased to act as receiver and manager on June 9th.

Stanfield Radio Co., Ltd.—Capital, £10,000 in £1 shares. Return dated January 11th, 1932. 7,002 shares taken up. £2,002 paid. £5,000 considered as paid. Mortgages and charges, nil.

Epoch Radio Manufacturing Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1931 (filed March 16th, 1932). 40 shares taken up. £40 paid. Mortgages and charges, £300.

L. Benn & Co., Ltd.—Capital £500 in £1 shares. Return dated December 31st, 1931 (filed April 4th, 1932). All shares taken up. £500 paid. Mortgages and charges, £1,000.

Eastern Wireless Co., Ltd.—Capital, £500 in £1 shares. Return dated December 30th, 1931 (filed March 18th, 1932). 500 shares taken up. £500 paid. Mortgages and charges, nil.

City Notes

The General Electric Co., Ltd., held its annual meeting on June 30th, when Sir Hugo Hirst, Bt. (chairman), in presenting the report and accounts (ELEC. REV., June 24th, p. 956), said they had been able to achieve results which varied very little from previous years. The dividend recommended had been reduced from 10 to 8 per cent., but with the outlook as it was the preservation of their internal strength was of the utmost importance. Interest on debenture stock was less by £4,782. This reduction was due to the conversion scheme carried out in the previous year. The benefits of this economy had only been felt during part of the financial year; later, there would be an additional saving. New capital expenditure during the year had been practically wiped out by a corresponding amount of depreciation. The 7 per cent. mortgage debenture stock amounting to £380,240 was redeemed on September 30th, 1931. Regarding the world crisis, whilst there could not be real prosperity whilst the world was in its present state, he was convinced that even if the industry of this country had to face further setbacks there would be no disaster. The electrical industries were particularly justified in expressing these sentiments as they were spending a great deal in research and development, and consequently if some of the older departments showed a falling-off they were encouraged by new possibilities. There was a constant change in the nature of their productions, and as some of them disappeared from the market, research and invention had created new ones. Since the *Monarch of Bermuda*, for which they supplied the whole of the electrical equipment, had been put into commission in November last they had received a contract in connection with a similar ship from the same company. They had been successful with the development of mercury arc rectifiers, and had received several orders for them from railway companies. Continued progress had been made in the development of metal-clad switchgear, and they had recently installed gear with a breaking capacity of 1,500,000 kVA at 11,000 V. The Traction Department had entered the field of electrical equipment of trolley buses, several of which had recently been placed in service at Birmingham. At the Erith works they had undertaken during the year the manufacture of Chance coal washing plant.

In the Lamp Works further progress had been made. The new factory at Wembley was in full swing, and they were constantly improving the efficiency of their lamps, and periodically reducing the price. The price of Osram lamps was less than one-half of what it was ten years ago. The cost of a lamp should not be judged by its price alone, but also by the current it consumed during its effective life and the saving in current to the public for all the lamps which they had supplied during the last ten years owing to increased efficiency was something like £40,000,000, or more than double the price they had obtained for all the lamps they had sold during that period. They had been carrying on research and experiment with an entirely new kind of lamp, which, for the moment, they called the hot cathode lamp. This would save 70 per cent. of current, compared with the present standard lamp, and owing to its brilliancy and efficiency it would probably lend itself, in the first instance, to street lighting. The lamp was not yet ready for the market. Good progress had been made in their cable and telephone works, while the demand for domestic appliances of every kind was progressing satisfactorily. In the wireless field, every year since the beginning of broadcasting had proved a record year in output and sales. They had entered the field of supply companies and had invested about £750,000 in the establishment of these concerns, which were already yielding a small return. This part of the business had financed itself, and the present stage of development was being financed by a loan which entailed no liability upon the parent company. If they were down in export trade it was not due to any lack of energy or management. In every country the demand during the last year for every one of their articles had fallen by about 50 per cent. They had watched the Board of Trade returns of the British electrical industry and their share of it had not receded. The breaking away from the gold standard had not justified itself in the electrical industry as yet, mainly because countries to which it could export lacked purchasing power at the present moment or restricted imports. So far as their overseas companies were concerned they had suffered, particularly in Australia, where, however, during recent months there had been signs of the beginning of an improvement. The South African and Chinese companies had shown a slight improvement over last year. As regards heavy engineering, the demand in the country compared with previous years had dropped seriously, largely due to the economic policy of Government and public authorities. Stopping expenditure was not necessarily economy, and the time had come when one should consider whether wise expenditure on safe reproductive undertakings was not better for the community at large. The increase in the demand for electricity continued and must mean sooner or later more orders for heavy engineering plant. Regarding railway electrification, it was not only in the interests of the railways, but also of national importance that a more frequent, faster, and cheaper service in competition with road transport should be provided. It was bound to come as soon as a more normal mentality on questions of finance re-established itself, and when it did come it would give a tremendous impetus once more to the electrical industry of this country. There was no need for despondency for those in the electrical industry, but they must admit that finally they were dependent on the economic state of the country as a whole.

The Electric Supply Corporation, Ltd., held its annual meeting on June 30th. Mr. J. G. B. Stone (chairman), who presided, in presenting the report and accounts (ELEC. REV., June 17th, p. 920), said the gross earnings were reduced by the sale of the Hitchin undertaking as at July 1st last, and also by a marked reduction in the sale of electricity at Dumbarton. They had also sold their interest in the Alton District Electricity Co. The Chelmsford undertaking was now taking a bulk supply from the County of London Electric Supply Co., and the electricity charges had been materially reduced. The undertaking of the Hendon Electric Supply Co. in which they were so largely interested, would not be purchased next year by the local authority, and the next purchase date would arise in 1946. Good progress was being made by their subsidiaries in Sussex and Hampshire.

Mr. K. A. Scott-Moncrieff (managing director), in seconding the motion for the adoption of the report and accounts, said in the past they owned all the undertakings that they controlled and financed. These older undertakings were gradually being sold off, and the new ventures were being financed as subsidiary companies, the majority of which received supplies in bulk. They welcomed the arrival of the grid, and without the rates which they got from it they could not hope to deal in a satisfactory manner with rural supplies.

Greenwood & Batley, Ltd.—The annual meeting was held on July 1st, when Col. H. A. Micklem (chairman), who presided, before dealing with the company's business referred with regret to the death of Col. O. C. Armstrong, who had been the chairman of the company for nearly eighteen years. Referring to business during the year under review, the chairman said that it had been a bad year for companies engaged in general engineering. The depression had reduced the demand for engineering products, and consequently prices were low, competition keen, and their sales somewhat reduced. Their steam turbine department had had a fairly good year. Their knowledge of the design and manufacture of small geared turbines

from 5 to 500 h.p. had been acquired over a period of thirty-one years. In addition to their normal range of single-stage machines, they now manufactured multi-stage turbines to meet the demand for larger powers, and also small direct-coupled machines.

The Globe Telegraph & Trust Co., Ltd., held its annual meeting on June 28th, when the Earl of Midleton (chairman), in the course of his speech, said that the year under review had been the worst experienced in the history of the company, which had for the first time in fifty-nine years paid no dividend on the ordinary shares. The general depression had fallen heavily on telegraph securities and had had an adverse effect on their revenue. Cables & Wireless, Ltd., had paid no preference dividend in the last 2½ years, and the experience of great foreign companies had been the same, with the result that there had been a drop in the Trust's revenue from that source of £218,731 on the basis of last year's figures. The Trust had £600,000 invested in securities independent of cables. The new companies now on their list were largely electric light and power companies and similar securities, which had maintained and in some cases increased their dividends.

Petters, Ltd., report a net profit for the year ended March 31st last of £13,136, as compared with £35,335 in the preceding year, to which is added £45,016 brought in making £58,152. The preference dividend is paid and £44,589 is carried forward. The report states that the engine business, which has always depended largely upon export trade, has suffered from the continuance and increasing severity of world-wide depression. In consequence, heavy losses have been inevitable on stocks in foreign countries, foreign book debts, and exchange. The aircraft works have been fairly well employed during the year but at the present time are suffering from a marked shortage of orders. Economies are being made, but only a revival of trade at home and abroad can restore real prosperity to the company. Meeting: July 14th.

The Oxford Electric Co., Ltd., reports a revenue for 1931, including £75,187 brought in, of £115,492 (against £123,187 in 1930). It is proposed to place £75,000 to reserve and to maintain the ordinary dividend at 7 per cent., leaving £17,493 to be carried forward. The litigation with Oxford Corporation has been concluded by settlement under which part of the undertaking was sold as at March 31st, 1931, for £460,000. The actual transfer took place on December 31st last. The report states that the capitalisation will now have to be brought into accord with the reduced scope of the company's functions, and proposals will be shortly submitted to shareholders. Meeting: July 14th.

Andhra Valley Power Supply Co.—The Bombay correspondent of the *Financial News* reports that a big financial deal has just been completed between Tata and Sons, agents for the Andhra Valley Power Supply Co., and the Central Bank of India, in respect of a debenture issue of Rs. 125 lakhs by the Andhra Co. The Central Bank has taken up the whole issue, and arrangements are being made to offer part of it to the public in the near future. The debentures, which are being issued to pay off the existing sterling and rupee debentures falling due next April, are repayable within twelve years, and will bear interest at 6 per cent. The issue price will be about 97.

W. & T. Avery, Ltd.—Presiding at the annual meeting on July 5th, Sir J. Fortescue Flannery (chairman) said the conditions of world trading applied to them more than to most trading and manufacturing companies, but they had weathered the storm. They were maintaining their organisation in all the markets of the world, and if in some markets profits could not be secured under existing conditions, their goodwill was being enhanced, and the day would return when they would enjoy the fruits which must come to them as a result of keeping their hold upon these markets.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. has announced that it intends to redeem on February 1st next all the 5½ per cent. first debenture stock issued under a trust deed on December 31st, 1924, between the company and the Union Commercial Investment Co., Ltd., at the rate of £105 for each £100 of stock.

Belliss & Morcom, Ltd., report a loss for the year ended March 31st last of £6,468 (against a profit of £22,368 in 1930-31). This is deducted from a balance of £301,270 brought in, and it is proposed to pay a final ordinary dividend of 5 per cent., making 10 per cent. for the year, tax free (against 12½), leaving £275,336 to be carried forward.

Electric & Musical Industries, Ltd., has announced that trading for the current fiscal period will result in a loss, and owing to the uncertainty of world conditions it has been decided not to pay the dividend on the 6 per cent. cumulative preference shares due on July 15th next.

The Nico Light Co., Ltd., reports a profit for the year ended March 31st last of £1,020, as against a loss of £6,042 in the preceding year. No dividend is recommended, the amount carried forward being increased from £55 to £1,075.

Hall Telephone Accessories (1928), Ltd., in its interim report, states that the trading during the first half of this year is such that the directors feel justified in maintaining an interim dividend of 5 per cent., less tax.

The Hydro-Electric Securities Corporation has declared the usual half-yearly dividend on the 5 per cent. cumulative preference shares.

The East African Power & Lighting Co. has declared a final dividend of 4 per cent., actual, less tax, making 7 per cent. for 1931 (same).

The Kensington & Knightsbridge Electric Lighting Co., Ltd., has declared an interim dividend of 8.4d. per share, less tax, on the ordinary shares.

The Chiswick Electric Supply Corporation, Ltd., has announced an interim dividend of 5 per cent. actual (same), less tax.

The London Electric Wire Co. & Smiths, Ltd., has declared an interim dividend on the ordinary shares of 3d. per share, less tax at 5s. (same).

Cables & Wireless, Ltd., has considered the question of payment of a dividend on the 5½ per cent. cumulative preference stock in the light of the full financial results for the year ended December 31st last. As already announced, the directors had decided that the estimated results for that year did not permit of the distribution of any dividend on the preference stock. The complete figures now available, however, disclose sufficient profit for the year to enable them to recommend to the general meeting, which will be held on July 21st, that a dividend of 2¾ per cent. less tax, shall be paid on the preference stock.

E. K. Cole, Ltd., held their annual meeting on July 5th, when Mr. W. S. Verrells (chairman), who presided, said that the trading profits at £131,205 showed a substantial increase over the preceding year and constituted a record in the history of the company. The sales from February to June of the current year had exceeded those of the corresponding period of last year by 138 per cent.

The Barcelona Traction, Light & Power Co., Ltd., reports a total revenue for 1931 of $3,228,074, as compared with $4,596,957 in 1930, and a net revenue of $1,460,361 (against $2,714,986), to which is added $938,788, making $2,399,149. An ordinary dividend of 50 cents paid in March, 1931, absorbs $899,427, and $400,000 is placed to reserve, leaving $1,099,722, which it is proposed to carry forward.

The Electric & General Investment Co. reports a net revenue for the year ended May 31st of £4,841 (against £6,962 in 1930-31), to which is added £18,280 brought in, making £23,121. The preference dividend is paid, reserve receives £902, and £17,804 is carried forward. In the previous year there was an ordinary dividend of 10 per cent., and 1s. on the deferred shares.

The Victoria Falls & Transvaal Power Co., Ltd., reports a net profit for 1931 of £385,008, as against £381,417 in 1930. To this is added £194,463 brought in, making £579,472. The reserve again receives £50,000 and the ordinary dividend is maintained at 15 per cent., leaving £224,315 to be carried forward. Meeting: July 21st.

The Brazilian Traction, Light & Power Co., Ltd., has announced that as the restricted exchange situation in Brazil still continues, the board considers it advisable again to declare a stock dividend instead of a cash dividend. Accordingly, the dividend has been declared on the ordinary shares of no par value at the rate of one fully-paid ordinary share for each fifty fully paid shares held. The shares comprising such stock dividend will rank for dividend as from September 1st, 1932, but no dividend will be paid in respect of a fractional part of a share.

The Gatineau Power Co. and its subsidiary companies report a gross revenue for the first quarter of 1932 of $2,282,066 (as against $1,954,417 in the corresponding quarter of 1931), and a net revenue, before charging interest and depreciation of $2,113,175 ($1,736,202). The balance carried to surplus is $617,369 ($310,594). For the year ended March 31st last the net revenue available for interest and depreciation was $8,036,378, and the balance of earnings $4,490,536, or four times the interest on the 6 per cent. gold debentures.

The Bournemouth & Poole Electricity Supply Co., Ltd., has declared an interim dividend of 6 per cent on the ordinary shares (same).

The Richmond (Surrey) Electric Light & Power Co., Ltd., has announced an interim of 4 per cent. on the ordinary shares (same).

Stocks and Shares

TUESDAY EVENING.

THE amazing effect of the Government's proposals for the conversion of the 5 per cent. War Loan has been felt in every investment market of the Stock Exchange. Expectation had looked for the Government to offer a stock on a basis of a 4 per cent. yield, but events in the financial world moved so rapidly during the latter part of last month that the plans were modified, and 3½ per cent. adopted. As holders of the 5 per cent. War Loan can obtain cash, if they prefer to take the money rather than to exchange into the new stock, the feeling of possible resentment against so drastic a cut as that from 5 to 3½ per cent. can hardly be regarded as justified. On the other hand, it will be impossible to replace 5 per cent. War Stock with anything of similar character that will pay more than 3½ to 3¾ per cent. on the money.

Gilt-edged Stocks

Appreciation of this complete change of financial outlook had an instantaneous effect upon prices of gilt-edged stocks. It is difficult to know where to begin in the attempt to particularise, but, as one illustration, the recently issued 4½ per cent. Central Electricity scrip may be cited. Of this there was £10,000,000 offered at 96. The price on Thursday evening, June 30th, the day upon which, after Stock Exchange hours, the Chancellor unfolded his proposals, stood at 2¾ premium It is now 7 premium (after touching 8), with very little stock on offer. The 4½ per cent. debenture stock quoted in our lists has risen 4½ to 102½. London & Home Counties 4½ per cent. debenture is quoted at 98, ex the interest due on the 1st of next month. It would appear as though there is room for a rise of several points in the price of the stock.

Home Railway prior charge issues have spurted strongly. The recently offered 5 per cent. debenture stocks of the Metropolitan and Metropolitan District Railways are quoted at about 110, being a premium of 12½ in each case. The great difficulty has been to secure the stock for which buyers have been eager. In the rush to invest into reasonable substitutes for the 5 per cent. War Loan, the prices of all gilt-edged issues have appreciated from 5 to 10 points in the course of two or three days.

Newly Issued Shares

Similar conditions apply in the cases of the better-class preferences. Those in the electricity supply list which offer attractions to the permanent investor are in great request. Scottish Power new preference at 3s. 9d. premium are 2s. 9d. up. British Power new preference have risen 1s. 6d. to 21s. 6d. Amongst the ordinary shares, County of London new at 4s. 6d. premium have gained ¼. It is not surprising that there should be talk of early new issues by companies anxious to take advantage of the present state of affairs, and to obtain some of the money which is offered by holders of the War Loan who have decided, at all events for the moment, to accept cash rather than to convert into the new 3½ per cent. stock.

Home Electricity Supply

All the changes which have occurred this week in the Home Electricity Companies' shares are in the upward direction. Such a list of improvements has not been seen for many years past as that which can be obtained by placing to-day's quotations against those of no more than a month ago. This week's rises range from 6d. a share to as much as 6s. 3d. Reference to the lists will show how widely spread the advance has been, including in its scope the shares of the London companies and the ordinary shares and preference shares of provincial concerns. The debenture stocks in the group have risen anything from 2 to 5 points. Nor does this tell the whole of the tale, for in a great many cases it is impossible to find any debenture stock on offer, though the prospective purchaser may bid well above the nominal market quotation.

In the foreign group, Whitehall Electric 7½ per cent. preference are again flat, with a further fall to 10s. 9d. This is due to the apprehension felt in regard to the countries in whose undertakings Whitehall Investment Trust has placed most of its capital.

Home Railway Stocks

The outstanding feature in the market for Home Railway stocks is a rise of 9 points in Metropolitan consolidated ordinary, bringing it to 63½. This is due to the scheme placed by the directors before their fellow-proprietors, under which the Metropolitan Railway would be taken over on conditions that certainly give the Metropolitan proprietors handsome terms. Particulars were published last week, and although some little criticism has arisen in connection with the alternative offers made to the ordinary stockholders, the broad principle of generous treatment remains. Central London ordinary stocks have risen 6½ points to 80. Underground Electrics are 2s. better, and Districts at 51½ show an advance of 3.

Cables and Wireless

Declaration of a dividend on Cables & Wireless 5½ per cent. preference stock of 2¾ per cent., actual, came as a very pleasant surprise to the market. It was posted this afternoon, and had the immediate effect of putting up the price of the preference some 5 points. Most of the rise was held, and at 55 the stock shows a gain of 10½ points on the week. Following this jump, the "A" ordinary rose 3 to 17, and the "B" ordinary 2 points to 7. The effect upon Globe Telegraph was almost more electrical; the 6 per cent. preference shares, which had been quoted at 6¼, spurted to 9, a gain of 45s., plus the dividend deducted from the price on Monday in this week. The ordinary shares at 6¾ are £3 higher. The announcement had an exhilarating effect upon other stocks and shares in this market. Anglo-American Telegraph preferred ordinary at 92½ is 2½ higher. Marconi Marines at 28s. are 3s. 6d. up. Of the American issues, Internationals have gone back to 5, and American Telephone and Telegraph to 112¼.

Trading and Industrial

The same story of general improvement has found repetition in the list of shares in manufacturing companies. General Electrics rose 8s. 3d. to 42s. xd., before reverting to 40s., which left the price 5s., plus the dividend, higher on the week. Henleys have jumped to 5 15/16, showing a gain of 13s. 9d. Callenders are 5s. higher at 57s. 6d., and British Insulated are 6s. 3d. to the good at £3. Siemens have risen to 22s. 6d., and the whole of the market shows a complete change from its recent dull and somewhat stagnant condition. Amongst the iron and steel shares, Babcock & Wilcox rose to 45s. before reacting to 43s. 9d., at which price there is a gain of 7s. 6d. left on the week. Vickers touched 7s. 3d. before going back 1s. Even the Rubber Market awoke into life, and was the theatre of some fairly lively bidding for the low-priced shares.

Foreign and Dollar Stocks

One of the principal rises this week is in Tokyo Electric 6 per cent. bonds, which at 64½ show a gain of 12 points. Brazilian Tractions have improved to 12¼. In the list of Canadian-American utilities, there are rises marked in practically all the popular shares. Atlas ordinary are 4s. 3d. up at 10s. 9d.: the preference at 20s. 9d. are 5s. 3d. higher and the debenture stock at 102½ is 4 up. Buyers gave 105 for the stock to-day, Tuesday. The effect of the British War Loan conversion scheme as felt in New York and Paris is refreshingly hopeful, and the Stock Exchange is busier to-day than it has been for many years past. The point of doubt amongst members of the House is as to how long the activity is likely to last.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1930.	1931.	Price. July 5.	Rise. or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	64/6	+3/9	4 13 0
Brompton Ordinary	1	8½	8½	20/–	+1/–	4 18 3
Central Electricity 4½% Deb.	Stock	4½	4½	102½	+4½	4 7 10
Charing Cross Ordinary	1	8½	8½	30/–	+6d.	4 13 4
Chelsea	1	8¾	8¾	28/–	+6d.	5 0 0
City of London	1	10	10	41/3	+3/–	4 17 0
Clyde Valley	1	8	7	29/6	+2/–	4 15 0
County of London	1	11	10½	47/6	+ 6/16	4 8 3
Edmundsons' 7% Pref.	1	7	7	28/–xd.	+2/–	5 0 0
Elec. Dis. Yorkshire	1	9	9	37/6	+½	4 16 0
Elec. Supply Corporation	1	11	11	47/6xd.	+6d.	4 12 7
Kensington Ordinary	1	8	8	29/–	+6d.	4 16 7
Lancs. Light and Power	1	6½	7	29/6	+3/3	4 15 0
London & Home Counties 4½% Deb.	Stock	4½	4½	98xd.	+1½	4 11 10
London Electric	1	9	9	30/–	+1/6	4 13 4
Metropolitan	1	10	10	45/–	+3/–	4 9 0
Midland Counties	1	7	7	31/3	+1/8	4 9 7
Mid. Elec. Power	1	8	8	32/–	+½	5 0 0
Newcastle-on-Tyne Ordinary	1	6	6	25/–	+1/9	4 16 0
Do. 7% Pref.	1	7	7	28/6	+6d.	4 18 3
Northampton	1	10	10	43/9	+3/–	4 4 0
Notting Hill 6% Pref.	10	6	6	12xd.	+1½	5 0 0
North Met. Elec. 6% Pref.	1	6	6	27/–	+2/–	4 9 0
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	—	31/3	+3/–	5 2 5
South London	1	8½	8½	29/6	+1/–	4 15 0
Urban Ordinary	1	7	—	28/9	—	4 17 5
Westminster Ordinary	1	8½	8½	29/6	+1/–	4 15 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	10/9	– 1/16	14 9 2
Yorkshire Elec.	1	8	8	37/–	+3/3	4 6 6

HOME RAILS.

Central London Ord. Assented	Stock	4	4	80	+6½	5 0 0
Metropolitan	"	3½	2½	63½	+9	3 18 9
Do. District	"	5	4½	51½	+3	8 14 10
Underground Electric	1	8	7	18/–	+2/–	8 15 7

TELEGRAPH AND TELEPHONES.

American Tel. & Tel.	$100	9	9	112½	+2½	8 0 0
Anglo-Am. Tel. Pref.	Stock	6	6	92½	+2½	6 13 0
Do. Def.	"	1½	1½	20½	—	7 6 0
Cables & Wireless 5½% Pref.	"	5½	2¾	50½	+10½	5 0 0
Do. A 7½% Ord.	"	—	Nil	17	+3	—
Do. B Ord.	"	—	Nil	9	+2	—
Globe Tel. and T. Ord.	10	8½	Nil	6¾	+3	—
Do. do. Pref.	10	6	6	9xd.	+2½	6 13 4
Great Northern Tel.	10	20	20	24xd.	+1½	8 6 8
Marconi-Marine	1	15	10	28/–	+3/6	7 0 0
Oriental Telephone Ord.	1	12	12	2¾	—]	*5 1 0

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	—	—	3/9	—	—
Do. do. 2nd Pref.	5	—	—	3/9	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	"	5	5	300xd.	+55	—
Do. do. Pref. Ord.	"	8	8	127½xd.	+8	6 5 6
Brazil Traction	100	—	—	12¼	+¾	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	90	+3½	5 11 1
London & Sub. Trac. 5% Pref.	1	Nil	Nil	5/–	+ 1/16	—
London United Tram Deb.	Stock	4	4	56½	—	7 1 7
Mexico Trams, 5% Bonds	—	5	5	16½	—	30 5 10
Mexican Light Common	10₀	Nil	Nil	5	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	48½	–3	10 6 2
Victoria Falls Ord.	1	15	15	61/3xd.	+3/3	4 16 0
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	4	18/9	+1/9	4 5 4
Do. Pref.	1	8	8	30/–xd.	+1/8	5 6 8
Babcock & Wilcox	1	15	14	43/9	+7/6	6 8 0
British Aluminium Ord.	1	10	5	21/3	+ 1/16	4 14 1
British Insulated Ord.	1	15	15	60/–	+6/3	5 0 0
Brush Ord.	Stock	5	Nil	47	—	—
Callender's	1	15	15	57/6	+5/–	5 4 4
Do. 6½% Pref.	1	6½	6½	25/–	—	5 4 0
Crompton Parkinson Ord.	5/–	30	24	17/6	—	6 17 2
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	Nil	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3 7/16	+¼	7 5 4
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	8/9	– 1/16	—
Ever Ready	5/–	35.	35	25/–	+ 7/16	7 0 0
Ferranti Pref.	1	7	7	22/6xd.	+1/–	6 4 5
G.E.C. Pref.	1	6½	6½	28/6	+2/6	4 11 3
Do. Ord.	1	10	8	32/–xd.	+6/3	4 0 0
Henley's	1	30	30	5 15/16	+13/9	5 1 0
Do. 4½ Pref.	5	4½	4½	4½	—	5 0 0
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Philips	1	10	5	¾	—	6 13 4
Siemens Ord.	1	7½	7½	22/6	+3/–	6 13 4
Telegraph Construction	12	Nil	Nil	10	+½	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1930

36657. "Snap-action electric switches." R. F. Power. December 4th, 1930. (Cognate application 38518/30.) (374418.)

36676. "Gaseous electric discharge luminous devices." Claude Neon Lights, Inc. December 7th, 1929. (374419.)

1931

3315. "Electric capacitors." British Thomson-Houston Co., Ltd. February 1st, 1930. (374439.)

6622. "Method of producing an electrochemical reaction between the gases of a gas mixture by means of glow discharges." Metallges Akt.-Ges. April 2nd, 1930. (374485.)

6737. "Gas-blast electric switches and circuit-breakers." International General Electric Co., Inc. March 5th, 1930. (374458.)

6913. "Means for protecting sections of an electric line." Siemens-Schuckertwerke Akt.-Ges. March 6th, 1930. (374461.)

7004. "Electric glow discharge amplifying tubes." G. Seibt and H. Bley. March 17th, 1930. (374425.)

7166. "Terminal connections for electric heating elements." A. Imberry and British Resistor Co., Ltd. March 7th, 1931. (374431.)

7176. "Electric signalling systems." Automatic Electric Co., Ltd., T. R. Rayner, G. A. Burns, and P. F. Gunning. March 7th, 1931. (374432.)

7288. "Electric discharge device systems." British Thomson-Houston Co., Ltd. March 20th, 1930. (374445.)

7289. "Alternating-current electric motors." International General Electric Co., Inc. March 7th, 1930. (374446.)

7306. "Systems of protection of three-phase circuits." Johnson & Phillips, Ltd., and S. A. Stigant. March 9th, 1931. (374448.)

7375. "Electric glow-discharge lamps." Westinghouse Lamp Co. March 21st, 1930. (374466.)

7553. "Junction boxes." India Rubber, Gutta Percha and Telegraph Works Co., Ltd., and H. Leared. March 11th, 1931. (374500.)

8936. "Coupling a two-way path to two one-way paths in electric signalling systems, and devices therefor." Standard Telephones & Cables, Ltd., K. E. Latimer, and A. R. A. Rendall. March 16th, 1931. (374528.)

8037. "Cathode-ray oscillograph tube." Standard Telephones and Cables, Ltd., L. H. Bedford, and D. G. Coveney. March 16th, 1931. (374529.)

8196. "Mounting of electrical apparatus." Siemens Bros. and Co., Ltd., and A. F. Thorne. March 17th, 1931. (374534.)

8323. "Electric cables." C. J. Beaver and W. T. Glover and Co., Ltd. March 18th, 1931. (374537.)

8350. "Wireless receiving sets." A. G. Franklyn. March 18th, 1931. (374538.)

9183. "Fascimile tele-printing and the like." D. H. Byron. March 26th, 1931. (374546.)

9467. "Electrically driven indirectly acting regulating devices." C. Kiessling and Allmanna Svenska Elektriska Aktiebolaget. March 28th, 1931. (374553.)

9601. "Electric circuit-interrupters with contact in oil or other insulating liquid." W. A. Coates and Associated Electrical Industries, Ltd. March 30th, 1931. (374554.)

9629. "Electrical accumulators." W. Haddon and W. Haddon. March 30th, 1931. (374555.)

10057. "Electric regulators." British Thomson-Houston Co., Ltd. April 7th, 1930. (374559.)

10487. "Scanning apparatus for use in television and like systems." J. L. Baird and Baird Television, Ltd. April 9th, 1931. (374564.)

10509. "Direct-current generators." Sir W. G. Armstrong, Whitworth & Co. (Engineers), Ltd., and C. M. Beckett. April 9th, 1931. (374565.)

12779. "Electric condensers." British Insulated Cables, Ltd., B. Welbourn, and A. H. Human. April 30th, 1931. (374581.)

13288. "Electric imitation fires." H. H. Berry. May 5th, 1931. (374587.)

13535. "Manufacture of high-tension electric cables." A. L. Chandler, C. J. Beaver, and W. T. Glover & Co., Ltd. May 7th, 1931. (374,591.)

13634. "Electrical heating of buildings and the like." J. L. Musgrave and R. Crittall & Co., Ltd. May 8th, 1931. (374593.)

13924. "Ventilation or cooling of electric motors." C. Filmer and Associated Electrical Industries, Ltd. May 11th, 1931. (374595.)

15298. "Electric circuit-breakers." G. Ellison and G. Ellison, Ltd. May 23rd, 1931. (374609.)

15809. "Means for controlling arc-rectifiers." Siemens-Schuckertwerke Akt.-Ges. July 26th, 1930. (374616.)

15822. "Electrical condensers." Plessey Co., Ltd., W. O. Heyne, and P. J. Packman. May 29th, 1931. (374617.)

15886. "Electrical contacts for switches and circuit-breakers for use with alternating electric currents." H. Pearce and Associated Electrical Industries, Ltd. May 30th, 1931. (374619.)

15989. "Radio-receivers." Telefunken Ges. für Drahtlose Telegraphie. May 31st, 1930. (374621.)

16709. "X-ray apparatus." F. S. Smith. June 8th, 1931. (374628.)

17649. "Plug-in connection for electric switches." H. B. Prentice. June 18th, 1931. (374637.)

18550. "Electrical liquid-heaters." L. Mermet. June 27th, 1930. (374644.)

18736. "Arrangement for feeding electric loads of which the starting voltage is higher than the working voltage." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 26th, 1930. (374646.)

21691. "Control of synchronised electric motors." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. October 23rd, 1930. (374678.)

22473. "Electrolytic cells and electrolytes therefor." R. S. McNellis. August 8th. 1931. (374684.)

23,403. "Radio and other high-frequency receivers." Marconi's Wireless Telegraph Co., Ltd. August 19th, 1930. (374695.)

23790. "Electric discharge devices." International General Electric Co., Inc. August 25th, 1930. (374,699.)

24531. "Electric circuit-breakers." Westinghouse Electric & Manufacturing Co. September 6th, 1930. (374708.)

24,920. "Method of and means for assembling screened wireless receiving apparatus." D. Montague and S. Montague. September 4th, 1931. (374711.)

24994. "Electric clocks." A. G. Smith. September 5th, 1931. (374713.)

25743. "X-ray tubes." International General Electric Co., Inc. September 13th, 1930. (374722.)

26358. "Systems employing isolating switches for operating power switches." Siemens-Schuckertwerke Akt.-Ges. October 2nd, 1930. (374727.)

26397. "Electric condensers." Elektrizitäts Akt.-Ges. Hydrawerk. September 29th, 1930. (374728.)

27214. "Junction boxes for electric wires or cables." W. G. M. Robinson and F. L. Witcomb. September 30th, 1931. (374740.)

28919. "Electrical advertisement clock." F. Schneider. October 17th, 1931. (374746.)

29612. "Electromagnetic warning devices." R. Bosch Akt. Ges. November 29th, 1930. (374748.)

30151. "Control for electron tubes." Igranic Electric Co., Ltd. October 30th, 1930. (374752.)

30326. "Truck-type electric switchgear." Siemens-Schuckertwerke Akt.-Ges. November 20th, 1930. (374755.)

32700. "Electric machine drives." International General Electric Co., Inc. November 26th, 1930. (374774.)

35129. "Power-converting apparatus." British Thomson-Houston Co., Ltd. December 20th, 1930. (374788.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned:—

June 22nd

Isep (lettering and design). No. 529750. Class 5. Wire.—La Société International Safe Electric Products, 49, Rue Rochechouart, Paris, France. (British representative: R. Radeglia, 13, Fish Street Hill, E.C.3.)

Philomel. No. 529540. Class 8. Radio receiving sets, radio gramophones, &c.—Philip T. Hobson, trading as Philomel Radio Equipment (P. T. Hobson), Pickering Street, Loose, Maidstone.

Tudos. No. 522098. Class 13. Electric lamps (ordinary).—Henry J. B. Franks, trading as H. B. Franks, 4, Cullum Street, E.C.3.

Ajustiloc. No. 530707. Class 13. Electric switches, coupling sockets, combined switches and sockets, adaptors, grid plates, &c.—J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.

Andor. No. 531572. All goods in Class 13.—A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.

Kappit. No. 530388. Class 50. Devices for connecting together the ends of electric wires and made principally of insulating compositions.—Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.

Panilax. No. 530566. Class 50. Electric insulating materials manufactured from vegetable fibres and resin.—The Micanite & Insulation Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17.

June 29th

Bio-Sloray. No. 531759. Class 4. Carbons for electrical purposes.—Siemens-Planiawerke, Gesellschaft, 128-139, Herzbergstrasse, Lichtenberg, Berlin, Germany. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Sifsil-Copper. No. 529982. Class 5. Copper in rods for use in welding.—The Suffolk Iron Foundry Co. (1920), Ltd., Prentice Road, Stowmarket.

Hotpoint Duplex (lettering and design). No. 529757. Class 6. Electric vacuum cleaning machines.—The Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.

Psychon (lettering and design). No. 531295. Class 8. Wireless telephonic and telegraphic instruments, electric accumulators (not for medical purposes), electric cables, induction coils, electrical resistances, fitted electrical switchboards, &c.—Psychon, Ltd., 4, Westminster Palace Gardens, Victoria Street, Westminster, S.W.1.

Silko. No. 521748. Class 8. Electrical resistances formed of bare wire, wireless telephonic, telegraphic and television transmitting and receiving apparatus, telephonic and telegraphic instruments, &c.—De Bary & Co., 1, Augustinergasse, Basle, Switzerland. (British representative: H. Douglas Elkington, Halton House, 20-23, Holborn, E.C.1.)

Crosley (lettering and design). No. 523447. Class 8. Radio receiving sets.—The Crosley Radio Corporation, 3400, Colerain Avenue, Cincinnati, O., U.S.A. (British representatives: Carpmael & Ransford, 24, Southampton Buildings, Chancery Lane, W.C.2.)

Paratrap. No. 532507. Class 3. Telegraph and telephonic instruments and apparatus and parts thereof.—The Paragon Rubber Manufacturing Co., Ltd., 12, Norfolk Street, W.C.2.

Tungstalite. No. 522237. Class 13. Incandescent electric lamps (ordinary).—Tungstalite, Ltd., 47, Farringdon Road, E.C.

Acweeco. No. 529929. All goods in Class 13.—The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, 21, Douglas Street, S.W.1.

Design only. No. 531867. Class 13. Electric heating stoves, refrigerating plant, &c.—Robert Bosch Gesellschaft, 4-8, Militarstrasse, Stuttgart, Germany. (British representatives: Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2.)

Ewebec. No. 529915. Class 50. Formers made principally of vulcanised fibre for wireless telephonic induction coils.—Ewart William Evans, trading as the Eweington Electrical Manufacturing Co., 5, Beckington Road, Leicester.

Lissen. No. 532388. Class 50. Articles made wholly or principally of synthetic resin.—Lissen, Ltd., Lissenium Works, Worple Road, Isleworth, Middlesex.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Additions to medical block of new Royal Infirmary (£72,000); master of works.

Aylesbury.—Equipment of factory, Buckingham Street, for Agro Electrical Co., Ltd.

Barnsley.—Re-erection of bazaar stores, Eldon Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

Barnstaple.—Houses, Gloucester Road, for the T.C.; J. Cater and Son, Barnstaple.

Bexhill.—Houses (10) and hotel; E. Bunce, Sea Road. Shops and houses; J. E. Maynard, Collington Avenue. Houses; Tubbs and Messer, Endwell Road.

Birmingham.—Houses (90), Greenhill Estate, Moseley; Jno. White, builder, 5, Edmund Street.

Bishop Stortford. — Extensions, Haymeads Institution (£31,796); J. Mackenzie, builder, Hendon. Houses (104), South Road, for Alfred Clark, Ltd.

Blackpool.—Elementary school (240 places), off Norbreck Road, for E.C.; borough surveyor, Municipal Buildings.

Blockley (WORCS).—Re-erection of works, Draycott, electrically equipped, for C. Butler.

Bolton.—Houses (252), Johnson Fold Estate; H. E. Pitt, Ltd., Sunderland. Houses (164), Johnson Fold Estate; William Townson & Sons, Ltd.

Brighton.—Alterations, Hippodrome, Middle Street; General Theatres Corporation, Ltd. Houses (62), Bevendean Crescent; Braybons, Ltd. Bungalows (20), Wick Estate; Coastal Estates (Eastbourne), Ltd. Houses (50), Ladies Mile Road; G. Ferguson and Son.

Buglawton (CHESHIRE).—Houses (50); J. H. Walters, U.D.C. surveyor.

Cardiff.—Laundry, Llandough Hospital (£6,192); P. L. Jeans.

Cheshire.—Primary school, Sale; county architect, Chester.

Chester.—Houses (36), Parkgate Road, for W. Lacy, Prescot.

Chester-le-Street.—Premises for the C.W.S.; Buildings Department, West Blandford Street, Newcastle.

Chingford (ESSEX).—Welfare centre, for the U.D.C.; S. J. Hellier, surveyor.

Denbighshire.—Public assistance institution, Wrexham, for the C.C. (£49,197); Humphreys, Ltd., builders, Knightsbridge, London.

Durham.—School at Hurworth for E.C.; F. Willey, county architect, 34, Old Elvet, Durham.

Edinburgh.—Building for the trustees of hospital for crippled children; Reginald Fairlie, architect, 7, Ainslie Place.

Ellesmere Port and Whitby.—Houses (100); U.D.C. surveyor.

Enfield.—Houses (34), Parsonage Gardens; G. Reed. Factory, Green Street; Chamberlain & Willows.

Essex.—Senior school, Milkwell Estate; library and combined treatment centre, Chingford (£10,436); school, Triptons Estate, Becontree Heath; senior school, Pitsea (£27,811), and extensions, Pitsea school (£14,822); high school, Romford (£45,471); J. Stuart, county architect, Chelmsford.

Exeter.—Houses (62), Burnthouse Estate; Wilson, Lovatt and Sons, Ltd. Houses (35) and flats (28), Exwick Road; Exeter Workmen's Dwellings Co., Ltd.

Exmouth.—Pavilion on sea front for the U.D.C.

Failsworth.—Bakery for Failsworth Industrial Co-operative Society, Ltd., Chapel Street, Newton Heath, Manchester (£40,000); plans by Mr. W. Johnson, C.W.S., Ltd., Balloon Street, Manchester.

Farnworth.—School (400 places), Bradford Road; E.C.

Finchley.—Shops (7) and flats (14), Falloden Way; Kentish and Sons.

Gillingham (KENT).—School, Skinner Street; borough surveyor.

Glasgow.—New Bedford Picture House (£25,000); Lennox and McMath, architects, Glasgow. Houses (260), for Corporation at Nitshill, and City hospital; city architect.

Glossop.—Bazaar premises, High Street West, for F. W. Woolworth & Co., Ltd., London.

Hertfordshire.—Schools, Waterdell, St. Stephen; county surveyor, Hatfield. School, Leggatts Way, Watford (£41,239); S. Daw, architect, Rickmansworth.

Horsforth.—Houses (20), on Cragg Hill Estate; J. E. Aldersley, architect, Council Offices.

Houghall Colliery (DURHAM).—Miners' hall and institute; E. Rutter & Sons, builders, Esh.

Houghton-le-Spring.—Houses (75); V. J. Hunter, U.D.C. surveyor, Council Offices.

Hove.—Y.M.C.A. buildings (£7,000); S. Phillips Dales, 63, High Holborn, W.C.1.

Hoyland.—Electric light installation, Kirk Balk Senior school, for West Riding E.C.; education officer, County Hall, Wakefield.

Huddersfield.—Houses (32), Diamond Street; borough engineer, 1, Peel Street.

Irish Free State (CORK).—Houses at Evergreen site, for the Irish Sailors' and Soldiers' Land Trust; W. J. Brown, architect, 51, Upper Mount Street, Dublin. (DUBLIN).—Houses (320), Cabra Housing Area, for the Corporation; housing architect, Exchange Buildings, Lord Edward Street, Dublin. (GALWAY).—Rebuilding Council Buildings, Prospect Hill (£7,883); T. Kennedy & Sons, builders, Galway. (KILKENNY).—Houses (23), Thomas Street; Ennis Bros., Mullingar.

Iver (BUCKS).—Church, Sutton Lane, for the Congregational trustees; H. J. Weston.

Kent.—Nurses' Home at King Edward Avenue Hospital, for Dartford C.C.; Gerald E. Burgess, architect, Market Place Chambers, High Street, Dartford.

Kidderminster.—Houses (100), Broadwater Estate; J. Hawcraft, borough engineer.

Lanarkshire.—Houses (40), Viewpark, and 32, Carluke, with electrical work, for the C.C.; P. C. Smith, 13, Clydesdale Street, Hamilton.

Lancaster.—Houses (100); borough engineer.

Leadgate (DURHAM).—Houses (33) in Front Street; U.D. surveyor, T. Ripley, Council Offices.

Leeds.—New church (Ripon Diocese) at Osmondthorpe Lane; F. L. Charlton, architect, Gordon Chambers, 21, Bond Street. Factory for C. M. Sumrie, clothier; C. Castleton, architect, 10, Park Row, Leeds. New building for the Direct Woollen Co., Ltd.; A. and F. Mosley, architects, Wormald Row.

London.—(BENNINGTON).—Factory extension, Fordmill Road, James Robertson & Sons (Preserve Manufacturers), Ltd. (HACKNEY).—Houses (22), Meynell Crescent; Maynell Gardens Estate. Extensions to poor law hospital (£20,100); C. H. Roberts & Co., Ltd. (KENSINGTON).—Rehousing scheme for 60 persons, Dalgarno Gardens; borough engineer.

Manchester.—Houses (146), Revensbury Estate and Newton Heath (28); city architect.

Middlesex.—Various buildings at mental colony, Shenley; £40,000; county architect.

Nantwich.—Hotel (£7,000) for Peter Walker, Ltd., Warrington; Mr. Rigby, architect.

Newark-on-Trent.—Alterations and improvements to the Robin Hood Hotel; architect to James Hole & Co., brewers, Albert Street.

Newcastle-on-Tyne.—R.C. school (400 places); Mr. Macken, builder, Felling.

Newhaven (SUSSEX).—Houses (70) for the Workmen's Housing Association.

Newton-in-Makerfield (LANCS).—Houses (100) for the U.D.C. J. Elston, architect, 18, Queen Street, Earlestown, Newton. Willows.

Northampton.—Fire station (£30,000) and baths (£80,000), houses (100), St. Davids Estate, and Abington Estate (100); borough engineer.

Northern Ireland.—(PORTADOWN).—Branch office for Ulster Bank, Ltd.; W. H. Stephens & Sons, architects, 13, Donegall Square North, Belfast.

Northfleet (KENT).—Factory extensions, Crete Hall Road, for Henley's Tyre & Rubber Co., Ltd.

Padiham.—Library; surveyor to the U.D.C.

Peterborough.—Houses (180), Park Lane Estate; W. H. A. Court, city engineer.

Plymouth.—Houses (232), Barne Estate; city architect.

Preston.—Extensions to St. Joseph's Hospital, Mount Street, Preston, for Board of Management (£40,000); W. Mangan, architect, 18, Guildhall Street, Preston.

Rainford (LANCS).—Houses (50), Golden Lion site; U.D.C. surveyor.

Reigate.—Houses (72), with electrical work, for the T.C.; Howell & Burgess, builders, Hounslow.

Richmond.—Houses (58), Ham; borough surveyor, J. W. Trodd, Town Hall.

Romford.—School, Rush Green (£9,897); Hutton & Sons, builders.

Salford.—Broadway Super Cinema at Leaf Square, Pendleton; P. Cummings, architect, 27, King Street West, Manchester. Re-erection of Adelphi Ironworks for Sir James Norton Farmer & Co., Ltd.

Scarborough.—Church hall (£5,000); W. T. Petch, builder.

Seaham Harbour.—School for the Durham County E.C.; F. Willey, architect, 34, Old Elvet, Durham.

Shipley.—Houses (34), Wrose Road; Claremont Land Development Co., Ltd. Cinema and theatre, Leeds Road; G. Whitake.

Slaithwaite (YORKS).—Re-erection of spinning shed for Pogson & Co., Bridge Street Mills (£30,000).

Slough.—Covered market, Buckingham Gardens, for F. Ion. Smith.

Southport.—School, Farnborough Road; director of education, Town Hall. Houses (104), Guildford Road Estate; borough engineer. Building development, Marshside Road; Duncan B. Gray & Partners.

South Shields.—Flats (120), Green Lane, Tyne Dock; J. P. Watson, borough engineer, Town Hall. Rebuilding synagogue, Ogle Terrace; T. A. Page & Son, architect, King Street.

Stockport.—Houses (150) on a site known as Knight's Field at North Reddish for W. G. Smith, builder, Leicester Road, Reddish, Stockport.

Surrey.—Hospital, operating, observation and tuberculosis blocks, and modernising engineering services, Reigate institution, for the C.C. (£137,760); clerk, Kingston-on-Thames.

Swadlincote.—Houses (32), Church Gresley; U.D.C. surveyor.

Trawsfynydd (MERIONETH).—Erection of a new chapel at Cae Adda; Robt. C. Jones, architect, Caer Blaidd office, Blaenau-Festiniog.

Twickenham.—Shops (17) with flats (24) above, Heath Road; Gale, Heath and Sneath, architects, 15, New Bridge Street, E.C.4. Houses (28), Jubilee Avenue; Heathcote Estate (Whitton), Ltd.

Wellington (SALOP).—Pumping station, &c., for the U.D.C.; E. Sandeman, engineer, 15, Victoria Street, Westminster, S.W.

Welwyn Garden City.—Houses (55); Capt. W. E. James, U.D.C. surveyor.

West Riding.—School at Scholes, near Leeds; education architect, County Hall, Wakefield.

Wigan.—Extension to Nurses' Home, Bellinge Hospital; W. A. Walker, borough engineer, Municipal Buildings, Library Street.

Woldingham.—Church (£14,000); Sir Herbert Baker, architect, 14, Barton Street, S.W.1.

Wolverhampton.—Addition to Bushbury Hill Schools (£8,000); for E.C. Rebuilding premises of J. Gough Noake, Ltd.; Cleland & Hayward, architects, Waterloo Road.

Worcestershire.—Senior school, Evesham, for the County E.C.; director of education, Worcester.

Wrexham.—Houses (248), Spring Lodge Estate; Lockwood, Abercrombie & Saxon, architects, Cathedral Chambers, Chester.

York.—Houses (186) for the T.C.; J. H. Fenwick & Sons, builders, Hull.